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The
GEOGRAPHICAL JOURNAL

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COASTAL MAKRAN

J. V. HARRISON

Meeting of the Society, 2 December 1940

THERE are probably not many people who have had to make extensive journeys in that inhospitable country known as the Coastal Makran. Most of those who have done so however have felt so different from their fellows that they have had to write about it. Nearchus included an account of his voyage along this coast and of his journey inland to meet Alexander. In much more recent times a stirring description has been given of an adventurous journey made by Captain N. P. Grant in 1809 (*J. R. As. Soc.* V (1839) 328–42). The eastern strip of the country was in the limelight about 1871 when a large boundary commission under General P. J. Goldsmid visited it and adjoining country. W. T. Blanford and Captain O. B. St. John and Captain B. Lovett provided narratives of their travels in two volumes, 'Eastern Persia, 1876.' A member of the staff of the Eastern Telegraph Company, E. A. Floyer, made journeys across the western part in 1881 and records his experiences in an entertaining book called 'Unexplored Baluchistan.' Officers of the Survey of India visited the tract some ten years later in the course of their cartographical duties. Considerable discussion relating to the Makran is contained in the *Journal*, VII–X, in which T. H. Holdich, G. N. Curzon, M. R. Haig, G. P. Tate, and P. J. Goldsmid participated. Sir Percy Sykes makes references to his experiences near Chah Bahar, as do Sir Aurel Stein and E. H. Tipper. Fate decreed that my first survey for the Anglo-Persian Oil Co. Ltd., in 1918, should take me into this tract and that my last work for the company should have been done in the same district twenty years later. On six other occasions I visited it or stood on its doorstep, and I twice enjoyed long instructive flights over it, much the most comfortable and comprehensive way to view the Makran. The following account deals mostly with a tour lasting from November 1932 to April 1933, when I was accompanied by Mr. N. L. Falcon and Agha Nasrullah Mustofi.

One outstanding feature of the Makran is that the water-courses which, although they seldom contain running water, will be referred to below as rivers, are the natural roads for travel. West of the Zindan range rivers can

hardly ever be followed far, as they often occupy the constricted precipitous defiles and canyons known as *tangs*, parts of which may be inaccessible even to daring cragsmen. In Bashakard and Baluchistan however even the awkward camel easily makes its way north and south across the grain of the country, by following up the gravel-filled dry river beds. A second point arises from a comparison of the mountains of the Makran with those in the rest of Persia. A fundamental difference exists. The former are basin shaped or synclinal and their solid structure is hidden under a litter of harsh angular sandstone blocks loosely set in sand and dust. The latter are dome-shaped, usually their rock faces are cleanly swept, and they are as sound and solid as the crags of the Alps or the Andes. I can imagine no one wanting to climb a Baluch hill for pleasure, but the opposite is true of hills nearly everywhere else. A third feature is the abundance of benches and terraces found along all the rivers. They form an important part of the landscape and are much more prominent than anything seen to the west of Bandar Abbas. They are correlated with relics of raised beaches near the coast and preserve approximately the same interval between themselves and the present river level from source to mouth.

Choice of transport in the Makran is limited to camels or donkeys. Neither of these animals can be obtained in large numbers, so that the simpler the needs of the traveller the better. Donkeys are far more reliable and robust than camels, but bulky loads are more easily slung on camels. The camels differ from the hefty pack beasts which still compete with motor traffic along some of Persia's high roads, in that they are lighter in build and more petulent in temperament. Few dwellers in the Makran are so rich that they own more than a small group of them, so that a caravan is often composed of individual camels each with its owner in attendance, rather than of a train of beasts under one foreman. This arrangement entails much argument and quarrelling since each attendant looks for the lightest load for his own beast, and it often happens that the strongest masters have the strongest camels, so that the weaklings of both genera are left to deal with the heaviest loads. An artful and resourceful camp-boss is essential if both field work and travel are to proceed fairly smoothly with daily moves. He must be endowed with infinite patience, imbued with no little cunning, and be able to act energetically in case of emergency such as may occur upon camping journeys. Agha Nasrullah Mustofi, who accompanied me upon most of my journeys, was ideally equipped for the rôle, and handled Baluchi camel men, Bashakard tribal guides, Bakhtiati farrashes, Iranian Army escort, and British geologists with almost equal facility. It is wise to have a nucleus of men in the party from some distant province if this is at all possible, since the capacity of the local villager is rather limited, besides which it provides one with an enviable sense of independence which is invaluable where travel entails perpetual bargaining and no little bluff. A few blankets distributed amongst the camp followers is a wise precaution enabling the men from huts on the warm coastal belt to withstand the considerable rigors of an inland and higher climate. It makes them more serviceable members of the party.

The Bashakard goes scantily clad, in a thin vest, or none at all, and a rather skimp skirt or sarong, usually made of brightly coloured material. On the march he carries a cotton plaid over his shoulder. This serves as a shawl if it

is cold and as a blanket at night to keep out the low temperatures. As he lies on the bare ground with no other covering, his discomfort when, at a few thousand feet, it is both wet and cold, can be better imagined than described. His head dress is a little skull cap, but it may be set off with a scarf of coloured cotton or silk. Sandals of palm-fibre, kept in place by a fibre thong between the big toe and the rest and a loop of the same fibre around the heel, complete the wardrobe. Those who know the luxuries of the ports often boast a uniform coat or perhaps a set of tails by a London tailor. Almost the first man to apply for work when we were ready to start from Jask wore a coat of green cloth. The black scroll on the sleeve and the red piping seemed rather familiar to me, and it only needed a glimpse of the buttons to assure me that their coat of arms was described by a bit of doggerel I knew well as a child:

> " There's the tree that never grew,
> There's the bird that never flew,
> There's the fish that never swam,
> There's the bell that never rang."

A tram driver had once worn that coat in my own home town whose motto is "Let Glasgow flourish." The some time thriving trade in old clothes has largely died out now through the vigilance of the Custom Service, but it still gives zest to the lives of smugglers across the passes into Pusht-i-Kuh.

Jask was the port where we landed and equipped in 1932 as we had done in 1918 and were destined to do once again in 1937. On the first occasion the whole point was screened off by a fence of barbed wire entanglements giving the telegraph buildings a sense of security which half a company of infantry of the Indian Army adequately ensured. A telegraph superintendent was in charge of a staff so numerous that it could attend to the office duties and, at the same time, turn out the twenty-two needed for a game of cricket. On subsequent occasions the barbed wire had rusted away and the guard was gone, while the staff dwindled year by year until in 1937 a solitary Indian telegraphist represented the interests of the Eastern Telegraph Company. Their compound shows signs of age but is little changed, nor is there much difference in the village apart from a few new buildings to house Government offices. The aerodrome which was once visited by British, French, and Dutch planes is occasionally used now by the Dutch alone, or was until the war started. It seems to keep in good condition without attention. By 1937 wireless had been installed but was not yet in service: it seems an obvious step to replace the troublesome land-line maintained, at a price, for many years in spite of tribal interference and the vigorous corrosion by sea air, and dust.

This is still the coast of the ichthyophagist, for fish abound and are easily caught. The natives near the coast live upon them and feed them to hens, donkeys, cattle, and dogs impartially: a fresh-boiled egg in Jask recalls at times the efforts of a London chef to provide anchovy egg savoury. Some of the catch is sun-dried and used as a trade article, aromatic caravans plying five or six days' journey inland with it. It is exchanged for dates which provide the loads for the coastward trip. At some seasons of the year a little fish about the size of a minnow is washed up abundantly and forms strand lines

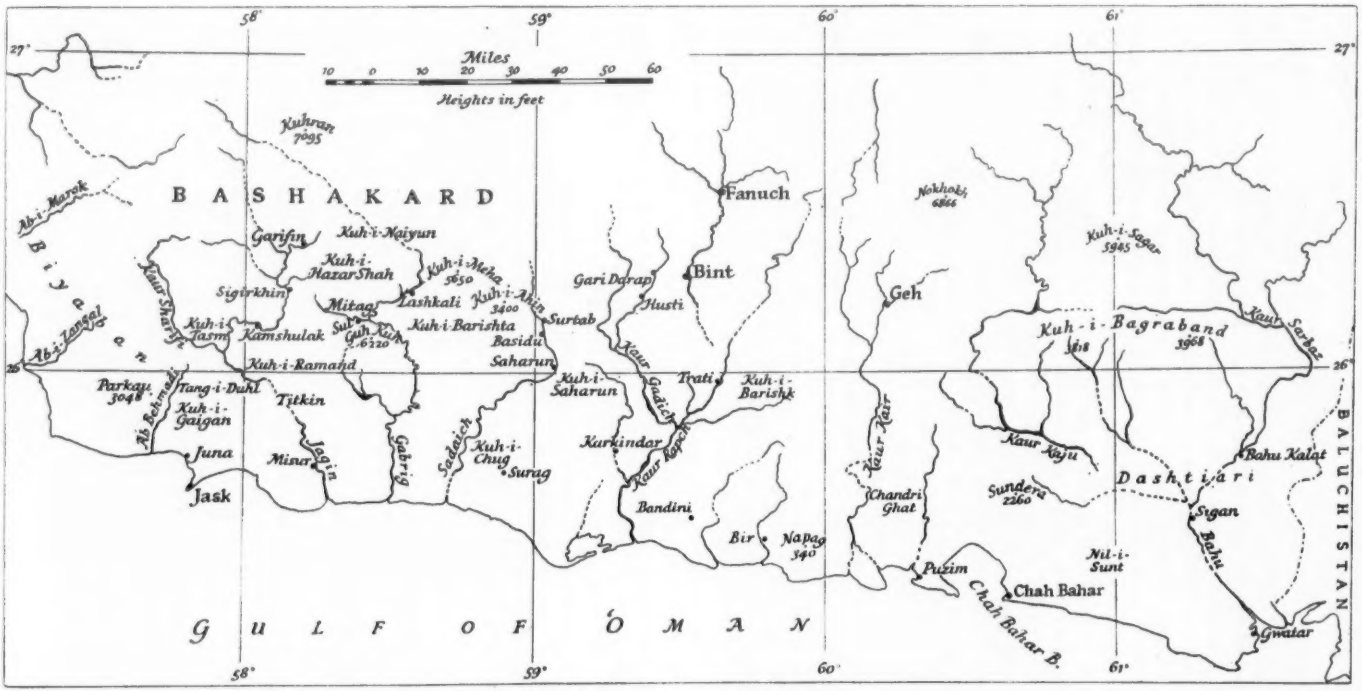
on the sand. These are gathered up and heaped in malodorous piles which are then bagged and sent to Ceylon as manure for the tea shrubs. The sea teems with sharks but no one appears to mind them: fishermen often swim out to their boats, anchored well offshore, and are not molested.

The resources of the ports themselves are slender and any visitor is well advised to arrive with substantial stores. The hinterland can supply only dates and goats. Cereals are grown in minor quantities, bread being used sparingly as a luxury. The standard of living is lower than in other parts of Iran and sugar and tea are rareties. After the Nu Ruz (New Year's Day, March 21) feast which we gave our men, the Bashakardis deposed that they had drunk more tea in one day than during the previous course of their lives. Inland they live principally on dates with which they drink copious draughts of water, eking this out with a little dried fish, bread, meat, or berries of the pish-palm as rather infrequent luxuries.

Our task was to reconnoitre and map geologically a strip along the coast 50 miles wide and reaching from Jask to the Baluchistan border. In 1918–19 this had been done for the contiguous province of Biyaban to the west. At that time the scourge of influenza had just swept through the land, filling it with new graves and emptying its houses far more effectively than the raids and fights resulting from feuds had done before. The bold chieftain of Biyaban, Mir Birkat, was alive and enjoying the power which he had won through his successes in gun-running. His agent in Jask, Dadullah, escorted us on that journey. He visited us again by night in 1932 after his master had fallen and been taken to Tehran. Many old enemies were seeking his blood, and they did not seek in vain, for one night in 1937 he and his wife were killed in their house.

Our journey began late in November 1932, after some difficulty in procuring the camels we needed. We planned to examine the area by running a series of traverses 50 miles inland, going by one route and returning by the next one available to the east. We used two plane-tables and started with the known points of Jask Telegraph Compound and Gaigan peak. From this base the map was kept going by intersection and resection until it tied on to the reliable points nearer the eastern frontier. Our programme involved ascending by one river, crossing a suitable pass to the next, and returning by this one. The first day's march was purposely a short one, for on the first day a caravan never assembles early, nor do men or beasts know their jobs. Camp that night amongst the dunes at Juna emphasized the sudden change in climate between the equable sea shore open to the sea breezes and a landward site cut off from them by even a narrow obstacle. After dark the temperature fell sharply, calling for our coats and the men's shawls. Next day, indeed for the next week while we were finding our form and becoming hardened, we found the unusual change from the cold nights to hot days rather a trial.

Juna was once a village of some importance, not too close to Jask to be disciplined from it but close enough to profit by its trade. A watch tower built on the old fort is the only conspicuous feature now, and a few huts in the place straggle out amongst the dunes. The people dress in Baluch costumes, wearing baggy trousers and a turban. We had also camped here in 1918, and I was reminded of what happened then: our tents had just been



Sketch-map of Coastal Makran

put up, and the four of us assembled in the one large tent to meet the distinguished-looking old chieftain who had at once come to visit us, supported by a peculiarly villainous and cut-throat-looking tail. We were all new to Persia and were relying upon a Goanese cook as interpreter, a man whom we soon discovered knew no more than a few words of kitchen Persian. The bearded patriarch was ushered into our tent and sat down; then, wasting little time upon compliments, he burst out torrentially in Persian upbraiding us for coming without his authority and safe conduct. When at length he had finished our leader haltingly remarked, "Kindly repeat as I can understand very little Persian." Such a reception left him amazed and speechless, and he withdrew having smoked a cigarette without further comment or rebuke.

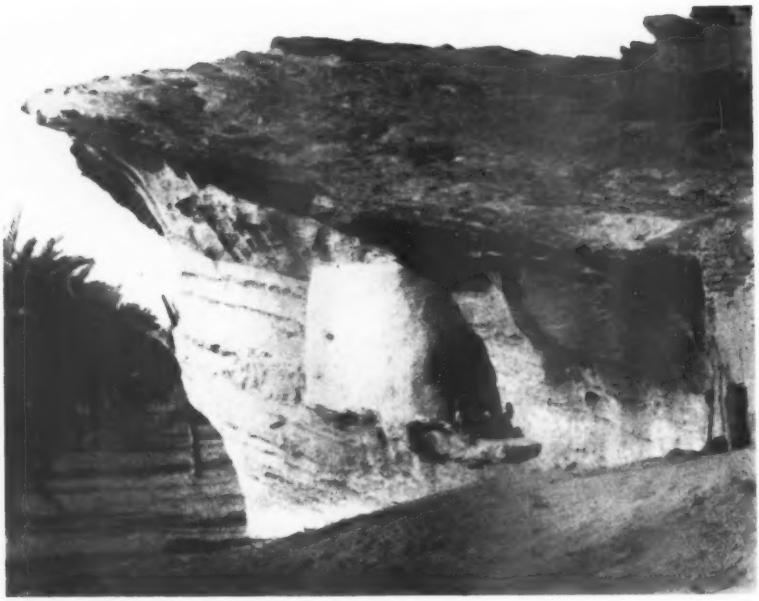
A short stage farther on, the road turns from the coast and passes inland following the Behmadi river, under the pale yellow cliffs of Gaigan which rise a sheer 1500 feet. These are unscalable from the west, but a gentle slope leads up to their summit from the east, a climb which we made to get the plane-table going. Although we could see the camp on the silt floor of the river below us it involved a long detour to get there, as we did eventually in a thick dust-storm. On the western side of the valley there is the higher but less precipitous peak of Parkau, the culmination of the hills on this bank. Upstream the silt floor of the river narrows to a meagre strip which deteriorates to a chain of pools lying between rocky walls. Such going is bad for camels which dislike the alternate wading and climbing of the rock steps of Tang-i-Duhl. This confined gateway inland is occasionally barred by floods after rain, but we traversed it when little water was running over the sills of the pools. Nevertheless at the last pool the water was so deep that most of our equipment had to be man-handled before camp was reached, and we arrived after dark, although the move was the shortest of any we made during the tour. Next morning however before the caravan started on its way the restricted view backwards was a pleasing one: near by was the dark pool through which we had come, with carious markings on the red walls above it, and beyond it stood golden cliffs and slopes gleaming in the morning sun. Upstream the canyon floor is sand-covered, making progress easy for the animals to the last spring of water which determined our stage that day. It proved so warm in the afternoon, shut in by cliffs and hills, that I sought camp early and the worse for the heat, a discomfort which must be put up with in the process of getting fit. A little farther on the valley opened out and the channel broke up into a multitude of branching feeders draining an expanse of desolate barren light grey clay rendered wearier still by occasional piles of red, brown, and yellow shards, relics of decayed concretions. On this waste lies the watershed between the minor stream we had been following and the valley of the Jagin river, to reach which we had taken this route as a short cut.

Where first we met it, the river was half a mile wide and all of its bed was covered with gravel from which groups of tamarisk and acacia trees sprouted. Surface water is usually restricted to a few pools often a mile or more apart. Above both banks rise a series of terraces of considerable width and surprising perfection, at intervals of about 50, 100, and 250 feet above the valley floor. These give way to sandstone hills on the south, and to the cockscomb ridges

Schuppen at Surtab

Graves near Garifin

Matting huts at Surag



Cliff house near Karkindar

appearing above the badlands into which silts to the north have weathered. We followed the main Jagin river northwards, leaving the western branch, the Sharifi, to be traced out in 1937. After a time terraces occur at five different levels. To shorten our journey we climbed over these to the shoulder of a low range known as Kuh-i-Tasm and then regained the Jagin higher up at Kamshulak. Our camp here lay near the western end of the large mountain mass which, rising to the east to a flat top known as Guh Kuh, formed the first we had met of the mountain units which extend almost east and west for 200 miles across the Makran coastal belt. The main rivers rise much farther north, on or beyond the range of Kuhran which we did not reach on this survey. They pass between these mountains flowing from north to south. Each mass is basin shaped: its cliffs face outwards and from there the beds which build the mountains slope gently inwards, producing either a slight central depression or merely a flat top. Streams rise on them and cut through the cliffs here and there, draining away any accumulating water. This usually emerges at some point or other along the gravel-covered bed and determines the distribution of the date gardens. These are often quite small and are limited to a short belt perhaps only 100 yards in length. Some are sufficient to support a house or two and others are uninhabited, but it is these small springs which are vital in keeping the minute population of the country alive. These oases owe their existence to the basin collecting the water and an impermeable bed trapping it under ground until it spills over the edge at some point lowered by erosion. The perennial supply is often the merest trickle, but it waters the palms and what is left over may be copious enough to collect behind a small dam for irrigating a plot, sometimes not more than 10 feet square, upon which wheat is grown.

In 1932 there was some restlessness, and as we moved inland our party was occasionally subject to suspicion. A caravan of forty or fifty camels might be a military one and its objective punitive, but the presence with it of two men who knocked bits off rocks had been noted and made a reassuring impression. Once or twice riflemen seemed inclined to dispute our passage and rifles sometimes went off, but this was due rather to sudden surprise than to malice aforethought. It is a difficult country to subdue, for resources are slender and the population both small and scattered. There are occasionally larger settlements farther inland, one of which we reached at our strictly enforced limit 50 miles from the coast up the Jagin river. At Garifin date-palms are much more numerous because water is more abundant. The village consisted of about a score of mat huts scattered amongst the palms over the wide floor of the valley. Our coming was reported to have raised some alarm together with a trifle of bellicosity amongst the young men, but the head man succeeded in stifling this without any of the stir reaching us. A few miles farther up this tributary of the Jagin stands another group of huts at Naiyun. The plane-table was set up on a hill above it and brought out all the men to watch us at work: every woman had been hurried off in the other direction, carrying as many household goods as possible in case of accidents.

Far more imposing than the villages are the graveyards. Well built, tidy, circular stone walls enclose the graves which are well cared for. They have head and foot stones, without inscriptions so far as I saw, and the rest of the

grave is decorated with coloured pebbles and fragments of rocks collected among the neighbouring hills. This tending of graves is a feature of Bashakard rather than the Baluch country. One other abnormal point about their graveyards is the way in which the walls round the graves do not often have doorways. Some of them do possess little openings large enough perhaps to admit a collie.

We had to retrace our steps down the Jagin for a full day before a road was found along which we and our camels could make easting. When we began to travel east it was along a route to the south of Kuh-i-Hazar and the only considerable pass was at Sigirkhin, beyond which lay easy gradients over terraces or along the river roads. A few small date gardens on the way showed how loot from the telegraph company may be usefully employed. Normally a pipe or aqueduct in these parts must be hollowed out of a palm trunk, but here was a small tank with water lead to it through a metal telegraph pole. We burst upon Mitag before the four or five old men occupying its four huts could leave, even if they had wanted to, and we were in time to find the whole community at home. It is concerned with tending a small flock of goats which make a living off the scanty vegetation around, chiefly in the beds of the streams draining to the south. These huts are characteristic of the region. The domed frame is made of date stems and is covered with straw mats tied on with pish string. The mats near the bottom can be lowered or raised to be snug or airy as circumstances require. They seem to be perfectly watertight when well made, and people, stock, and hens all settle down in them for the night together. Near by thorn-tree posts support the skins holding the water supply for immediate use, so that it cools off in the breeze. There is usually a hide under ground near by, in which some of the season's crop may be stored in relative safety.

After reaching the Gabrig river at Sul we made another excursion to the north-east, skirting the eastern end of the Hazar Shah range which was first encountered 20 miles away to the west at Garifin. Just above Sul the river course narrows to a few yards and strand lines were preserved nearly 20 feet above the bed. Such evidence shows that for a brief spell, after abnormally heavy rain, the rivers rise to considerable heights. After a short tortuous passage across the Mitag ridge the river opens out again and has a bed about a mile wide with terraces perfectly developed above it. The surface water is limited to the usual pools, but beneath the gravel enough remains to keep alive tamarisk, acacias, and a thorn tree upon which the leathery-mouthed camel can browse. Here and there clumps of oleanders were also seen. The altitude at this point is about 1500 feet and from about 500 feet below this level the pish palm thrives. It has rough, woody roots with long trailers, partly embedded in the river gravel and partly projecting, which suffice to keep it alive in the long hot summers. Its fronds provide most of the household wants of the Bashakard and Baluch natives. From them rope, mats, bags, saddlery, string, and sandals are made. The thud of stones used to beat out the pulp from the plaited fibres was perpetually heard in camp, for a pair of sandals would only last for about three days, just about the time needed to get another pair ready. I also saw pish used to furnish harness, to spin a drill to make fire by friction, and rolled into a cone which served as a pipe for a smoke.

Its fruit look rather like large hips and they are slightly acid in taste, providing some variety from the staple dates.

The head man here at Lashkali remembered the visit of an Indian surveyor who must have toured the district in the early nineties. He accompanied us for a few days as there was a report of some tribal trouble. Rumour had it that the hills around us were full of riflemen of the neighbouring warrior chief, Abdul Hasan Khan, and it was said that they might fall upon us for loot. However my colleague surprised two riflemen who probably comprised the bulk of the force as he was returning to camp from work. On being spied they at once made off and after this the excitement slowly subsided.

A little upstream from our camp another of the peculiar topographical types found in the Makran confronted us. Above the normal run of the hills, which for all their untidy surface are usually arranged in fairly continuous lines, steep spikes of rock project. They vary in colour and usually differ from the hue of the countryside. Some are claret red, some black, some purple, pale apple green, or even white, while the background is often sage grey. The rock masses vary in size from blocks a few feet across to bodies a quarter of a mile in diameter and hundreds of feet high. While they often stand out above the ranges they also stick out of the terraces like great haystacks, and though, within certain belts, they are scattered sporadically, the belts themselves are long strips running parallel to the grain of the country, that is, east and west. For want of a better name we called them *schuppen*, which signifies a tile or a flake, and for a time we were at a loss to explain them. However as evidence accumulated we formed the opinion that these flakes of harder rocks were carried up by the squeezing and flow of the softer shales which abound almost to the exclusion of sandstones along the schuppen belts. The shales were at one time flush with the schuppen or completely covered them, but erosion has rapidly worn them away and left the hard schuppen upstanding. The landscape produced is one of remarkable desolation and gives an impression of total chaos. Under the action of frost and insolation large angular blocks are broken off and pile up around the base of the schuppen, making the prospect drearier still.

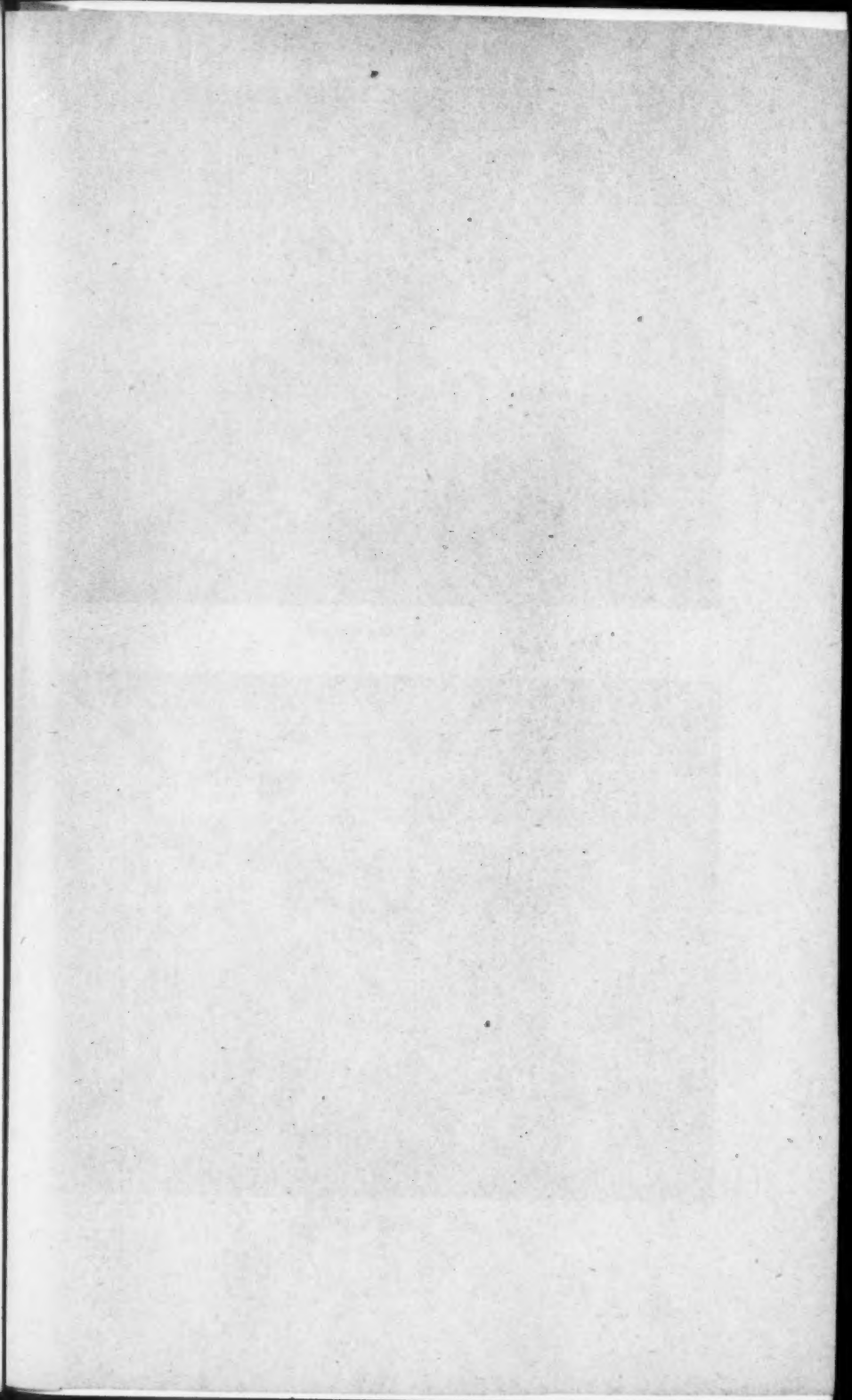
By comparison the isolated mass of Kuh-i-Meha, rising nearly 4000 feet above the neighbouring country and built up of regular beds of sandstone, seemed to be of noble proportions. It does not link up with any neighbouring range and stands out as another monument to the prodigious erosion which has taken place in fairly recent times. Terraces, part of the system found elsewhere in this province, run up to its base. A few miles to the south one of these was so littered with fragments of the white mineral calcite that the ground seen from a short distance seemed to be covered with snow.

When we left this northern plain for the south we followed a track rising steeply to a col nearly 800 feet above, which provided a crossing place over the Barishta range, an eastern extension of the Mitag ridge. Such a choice of route caused the camel owners considerable consternation, and they were only really content when we regained the Gabrig river. Heavy rain fell as we were crossing, but the thirsty land absorbed it all and none was left over to fill the streams. Back near Sul the river is overshadowed on the south by the red-brown cliffs of Guh Kuh, the highest of all the mountains standing

between the watershed of Kuhran and the coast. It stands 6400 feet high and the river at its foot is about 1000 feet above sea-level. The mountain has a very gentle basin structure as already described, so that the youngest beds in it are found on the mountain top. Some of these contain young fossil oysters, indicating that they were laid down below waters of the sea. As these beds are very slightly folded it is indicated that a recent uplift has amounted to more than 6000 feet and since then at least 5000 feet of beds have been removed over the bulk of the neighbourhood.

We found an easy route to the sea and marched over much terrace, dissected by occasional rivers with sandy or gravelly bottoms, rising on the southern side of Guh Kuh. We spent Christmas Day at Titkin on the flat desolate stretch bordered with light grey badlands, which looked far from seasonable after a night of rain and northerly wind. This week was abnormally cold for the Coastal Makran while the north wind blew steadily. In this country rain falls infrequently, but when heavy storms blow up from the south the quick run-off causes rapid erosion of the bare silty rocks. A finely displayed pattern of branching streams was visible from a hill close to the Jagin river where we crossed it on the edge of the coastal plain, incised into the soft sediments below. A short distance farther west at Misur, where a small salt-water spring bubbles up, we passed huts of a different design. These had a ridge-pole and sloping roof above walls made of bundles of reeds. Around these houses stood pens for sheep and goats, giving the whole the misleading appearance of a village. The scene then shifted farther east. As we marched we were able to examine and map the fringe of the hills on our left. Much of the sandstone lies nearly flat, but on account of minor differences in the cement it has weathered into fantastic shapes resembling ornate buildings immediately overlooking the coastal flat. Any silty beds interstratified with the sandstones are cut into badlands. The Gabrig river passes through a gorge crossing this wild waste of hills. It emerges on to the plain about 16 miles west of the Sadaich river up which we moved after a visit to Surag and hills to the south-east of it. The obstruction which these latter effect has caused the wind to pile up a small body of sand dunes right to the shore of the ocean. The hills themselves are notched and cut away in steps, each tread marking the level of a raised beach. These are equivalent to various terraces along the rivers, the intervals between them being approximately the same. A number of pinnacles stand up on the top of the Surag Hills and look like large statues from a distance or even the pillars of Stonehenge.

On all expeditions it is essential to halt at times for a day or two to deal with problems that arise, and a camp near the scattered huts of Surag served this purpose. A considerable population for these parts lives here, and from among it some replacements for our local staff were found. We went off for a few days with a light camp to allow the remainder of the camels to rest and graze well before again entering the unhospitable hinterland. This enabled us to map the mesopotamian country between the Sadaich and Rapch rivers which would otherwise have been hard to reach. Steep hills line the edge of the Surag plain, but easy paths into them were found along one of the minor stream beds. In due course we set off from Surag and passed the impressive



Napag mud volcano

Badlands east of Bir

Chandri Ghat: telephoto

Badlands near Bandini

Kuh-i-Chug, crossing a low col so as to strike the Sadaich some distance away from the plain. Terraces were once more prominent, and a rather wide zone is occupied by them between the two masses of the intermediate chain between which we camped on the second night, having Basidu to the west of us and Saharun to the east. The surface of the terraces is often covered by coarse manganese-stained gravel, except at occasional points where circular patches occur exposing silt completely clear of pebbles. The origin of these does not seem to be of human contriving, but may be due to a slight declivity into which the rain runs and then seeps away after the storms. On the nearly flat surface a sheet of water lies for a short time, and as this moves it could carry with it a load of fine silt to be left at the seepage point. There is very little vegetation on the well-developed terraces which, owing to their dark colour, heat up in the sun so that mirage plays over them in the afternoon and "dust devils" dance across them. Even in winter they can be hot and little imagination is needed to guess their summer-time ferocity.

At Surtab we reached our limit once more in a zone of schuppen and camped close to a rocky fang with a saw-edged range near by which recalled Los Morros de San Juan in far-off Venezuela. From each hill-top occupied with the plane-table we could see Kuh-i-Meha off to the west and nearer to us a large variegated schuppen known as Kuh-i-Ahin. The plain to our north was dominated by terraces punctured every here and there by haystack-like schuppen. Across it the watershed range of Kuhran confined our vista. The plain provided an easy road to the east and we travelled on it to the Gadich river, upon which stand beehive huts forming a fair-sized village. Date-palms extend for some distance above it and there are other collections of huts amongst them. These two villages, Huski and Gari Darap, are dependent on the Khan living at Bint. Our permit did not allow us to go so far, but a few years later we camped there and found it notable chiefly for the large date gardens near it. On this occasion we sent on to Bint for dates and secured supplies for the whole party at less than a halfpenny per pound.

On the return traverse, after passing through the weary schuppen land together, we separated into two parties and each followed a different route, thus obtaining more data of Kuh-i-Saharun and two of its neighbours to the east. They are all reddish-brown mountains whose cliffs overlook girdles of extremely broken badland country lying between them and the river terraces. Back on the broad coastal plain at Karkindar the camels at least enjoyed the contrast to the barren hills we had traversed. A series of heavy thunderstorms overtook us near here, in one of which nearly 2 inches of rain fell in about 1½ hours. One of the houses we passed as we travelled on was made of whitish clay and clung to an overhanging cliff rather like the home in which a mason wasp stores the stunned spiders for its grub to feed upon: the human edifice was also used as a storehouse. We again turned inland up the lower Gabrig, then forking north-east to Trati. The little village was entirely deserted, but their trails indicated that the villagers had seen us coming up the broad river bed and taken refuge with their cattle up a mountain gully. At several points on the way the river bed was more than a mile wide, but this is small compared with the lateral extent of its ancestor, which cut the bench and formed terraces miles wide. These certainly must have been cut by water and

there are great expanses of gravel which is never more than a few feet thick upon the bevelled beds below. If these were marine in origin, as the Tablazos are in Peru, shells would surely be found, for they are very abundant in most sections in Peru. Here in the Makran we never found a shell in the terrace material and so were compelled to conclude that they were the work of rivers. It is notable that the raised beaches near the coast are all shell bearing and, as remarked above, the intervals between them and the terraces are so close as to encourage the belief that the terraces conform with the beaches and mark intervals of rest between periods of movement affecting land and sea levels. At Trati a fan deposited by a stream in front of Kuh-i-Barishk conforms with the lowest terrace and has suffered erosion by the present stream which incises both fan and terrace. Farther east confluent fans were observed grading evenly into the sweep of terrace in front of them.

For the next hundred miles to the east range after range occurs, each an elevated basin in structure and all but contiguous with its neighbour, forming an intermediate chain only once breached by a river. A continuous belt of low country lies just south of it with a gently tilted mass of soft sandstones rising towards the coast beyond. Streams rise in the region of the low belt where they have shallow and wide beds, but when they cross the sandstones their courses are incised in gorges which become deeper and deeper as the coastal plain is approached. It is this combination of structure and erosion which produces the exceedingly picturesque rugged scenery in the desolate hills for some miles north-west of Chah Bahar. Along the border line between the hills and the plain, and rising here and there as stacks from the plain, gently dipping silts are found. They are less robust than the sandstones behind and are less permeable, so that the rain has developed in them an amazing pattern of serrated edges and anastomozing gullies, badlands *par excellence*. Going in these areas is most difficult: to walk along a crest recalls traverses along snow edges in the Alps or Zagros, and to gain access to a ridge it was necessary to cut steps in the silt. An ice-axe would be invaluable equipment for work in this region and the art of balancing is essential.

We emerged on the coastal plain at a little village called Bir, and the natives expressed their disapproval of us by calling the whole expedition "infidels." Most of our staff were practising Muhammadans, and so it is probable that the folk here have a mumbo-jumboism all their own. Their wrath was rooted in the universal principle expounded by prophets, priests, and kings, as well as dictators, that all should conform to the set model. A few miles to the east a large mud volcano has built its cone nearly 200 feet above the surrounding plain. In its early life soft fluid mud was erupted and formed a low cone nearly half a mile in diameter. Upon this pediment more recently, eruptions of thick tenacious mud have followed, building up the steep central part. When we visited it great bubbles of greenish mud were forming and bursting every few minutes; but there was ample evidence that rather violent spasmodic eruptions had taken place in the size of the flows which are visible crossing one another. The usual phenomena seen when flow occurs in viscous media were beautifully displayed here and cracking had developed as the mud dried. The change of load upon the rather weak surface had developed a series of little faults in the mud, most of which can be explained by the weight of a new flow

causing an older one to sag and break. This is known as Napag and is the largest of a suite extending along the Makran coast. Another one was found a few miles to the east on the same day's march. Its cone had suffered more erosion and was an asymmetrical heap on the plain which discharged a dribble of green liquid mud when we visited it. Outside the locus of this journey others exist both to the east in Baluchistan and to the west in Biyaban. We visited one there in 1918 which had built up a large, perfect, gently sloping cone, and was then discharging quietly: it appeared to be still active when we flew over it in 1936. In this barren country mud volcanoes are much more impressive affairs than those in Trinidad or the north of Venezuela, for there one cannot see them in perspective on account of the forest. Such eruptions as occurred at the Devil's Wood Yard in Central Trinidad in 1927 are as violent and as large as any even at Napag.

About the end of February, while we were camped on a terrace beside the Kaur Kair, a sharp rain squall took us unawares and every tent but one came down. It was a mild, moonlight night, so that we were able to see the funny side and gained valuable experience. The surface of these terraces is usually very hard and it is not possible to drive tent pegs in very far, but a short sharp rain reduces the hard top to a slurry in which no pegs can hold; for safety therefore the key pegs must be reinforced with boulders. About ten days later this lesson stood us in good stead. We had camped near to Nil-i-Sunt on the edge of a platform overlooking a wide gravel fan. About 2 p.m. the rain started, brought up by a strong south wind. I ran for home as there were river beds between me and camp and after such rain they come down, for a few hours, as torrents of mud. When we reached camp we found the whole place covered with sheets of water which soon softened everything. With darkness the wind increased and soon had the pegs supporting the tent walls extracted, but the guys under boulders held fast. The sides of the tent whipped about in the gusts all through the night, but the roof remained unmoved: it was bitterly cold, and even the hardy Lur farrashes employed on rescue work went about with chattering teeth. When the wind moderated about 3 a.m. I set up a rain gauge which had been blown over and collected nearly 2 inches in the next few hours, when the rain seemed to be moderate compared to what fell earlier. The rain soon drained off the gentle slopes around us and we were able to proceed along the northern flank of Nil-i-Sunt. Like the other range of the Makran it is a basin structure and much of its drainage escapes by a river emerging from this flank. Its present channel is cut deeply into a group of fans laid down by an ancestral stream then flowing at a higher level. Seen from an eminence the northern part of Nil-i-Sunt is serrated into rough difficult country crossed by a series of bare ridges.

A little north-east of Nil-i-Sunt the intermediate chain of hills, so often encountered by us on our traverses from Garifin onwards, dies down to the Dashtiari plain. When we first saw this three days after the rain it looked like a sea, so extensive was the flooding, and the water drained off slowly on account of the many walls built to hold up ponds after every freshet for watering the dates. About a week after the rain we crossed the Bahu river near Sigan and found it flowing strongly. Before wading this river the men trampled a path

for the camels to follow; their pads can get no purchase upon the slimy silt which is laid after each flood and they are liable to fall.

The Dashtiari plain is the most fertile part of Persian Baluchistan, and a crop of cotton is becoming of increasing importance, although dates are still the standby. A stage upstream stands the village of Bahu Kalat, which seems to have altered very little since Captain O. B. St. John described it in 1876. It was only here that we saw irrigation of the usual type in progress, the machine being a long weighted pole slung on a fulcrum at a point which is so chosen that the weight will lift the skin bucket with its charge and give the operator a down pull when the bucket is dropped again into the water at the lower level. The country to the north-east is the usual wilderness of ridges, terraces, wide river beds, and schuppen, which continue up to and across the frontier. One or two prominent ridges rise above the general level and twin peaks formed of a thick limestone sheet are conspicuous on account of their tidy aspect. Near the 50-mile line the Bagraband chain is reached. This runs as a range 75 miles long between the Sarbaz river on the east and the Kaur Kaju on the west. It rises to about 4000 feet, nearly 3000 feet above the river's floor. The south side of the range is scored by many gullies cut down to water-table. We followed one of these gullies down from the watershed, in spite of the warning of our guide, who had decided that my powers of rock climbing were probably unequal to the scramble ahead. He assured us that we could not get through, but we carried on, and in due course came to difficult crags where the route overhung a deep pool. It had not been foreseen that man can swim, and I was able to get through in this simple manner while others, more at home on rocks, clambered round and all returned safely to camp.

After we left this camp, haze was so thick that we had to carry on entirely by range-finder traverses for a week, before it cleared and we could again see points for resection. In early April another wet spell filled the rivers. During one afternoon of rain I failed to spot camp and so had to spend a night away from it. I and my three men were hospitably housed by some shepherds who allotted us part of a hut, the rest being devoted to goats. Next morning the Kaur Kaju was in spate and we had to ford it by wading, with water foaming up to our armpits, a rather trying experience for my men, none of whom could swim. We accomplished the crossing in safety by taking hands, thus holding up any one who should stumble. We soon found camp, which was only half a mile downstream instead of half a dozen up it. A few days later, in the middle of April, we arrived at Chah Bahar with our survey ended before the weather had become in any way disagreeably hot.

The Coastal Makran is of considerable interest both geographically and geologically. The question which arises is, what becomes of the Zagros ranges to the east of the Zindan range? The rocks of about the same age differ on opposite sides of this range. In the districts which have been discussed above, apart from the schuppen blocks, the rocks are nearly all Tertiary, and young Tertiary ones predominate. They are all shallow-water deposits, gravels, sands, and muds, and they contain shells which lived in a dirty but normally saline sea. A narrow strip of similar but thinner deposits is found north-east of the principal mountains of the Zagros, in Persia. In the Zagros zone the beds of the same age were thick, clean limestones or muds with a

deeper water fauna until about the middle of the Tertiary, when large deposits of salt and gypsum were laid down in a sea suffering intense evaporation. Then sandstones coloured red were laid down in shallow brackish water.

To the east, in the trans-Indus ranges running north and south along the western side of the valley, the Zagros conditions appear again at least in part. These two ranges look as if they had been linked up, but it is a matter of speculation how they were. The recent surveys of the Indian Ocean by Sewell Seymour's expedition show that there is a pronounced ridge running from the mouth of the Indus to the south-west, and from the successes attending the operations of the Standard Oil Company's work in the Rub-al-Khali as well as Lees' work on Oman, it is probable that the Zagros conditions continue across part of Arabia. Thus the two zones may be linked up somewhere to the south. What is certain is that this Zagros zone does not go through the Makran which was mostly land up to the Jurassic and has been land and shallow sea at intervals ever since. It is probable that the shelf of Jurassic times has continued to act as a body resisting the folding forces better than neighbouring deposits until late Tertiary times when the northern part was strongly folded. Even then the southern part was not much affected. After the folding movements the whole country was lifted up at least 6000 feet relatively to the sea, and the preserved terraces tell us that the movements have been spasmodic.

DISCUSSION

Before the paper the CHAIRMAN (Mr. LEONARD BROOKS) said: Dr. J. V. Harrison, who is going to lecture on the Makran Coast this afternoon, is no stranger to this platform. He has spoken here several times, and many of you probably remember that last May he gave a lecture on the Central Andes of Peru. For some twenty years Dr. Harrison was a member of the Anglo-Iranian Oil Company and on many occasions visited Iran. This afternoon he is, I believe, going to keep chiefly to a visit made in 1932 to the region of the Makran Coast, and I now ask him to address us.

Dr. Harrison then read the paper printed above, and a discussion followed.

The CHAIRMAN: I am sure you all agree that we have listened to an exceedingly interesting lecture from every point of view, for it has touched not only on physical geography but on many other aspects. I was going to ask Dr. Harrison whether the Zagros Mountains continued in the region of the Makran Coast, because the slides showing mountains in the coastal region did not bear any resemblance to the Zagros Mountains. Dr. Harrison concluded with some explanation in that regard but rather tantalized us, as his old tutor Professor Gregory often did, by leaving something not quite explained. It is clear from what we have heard that Dr. Harrison has much more to tell about the region of the Makran Coast, and I hope we shall have the opportunity of hearing him again.

Sir PERCY SYKES: I should like to congratulate Dr. Harrison on his lecture. I was for many years Consul for Kerman and Persian Baluchistan, and undertook many journeys in the area about which we have heard. On my first introduction to this very wild country I was one day marching along when I saw a dead man and a looted caravan. The raiders had taken the sugar, but the tea they had thrown away because they did not know what it was; this gave me some idea of their stage of civilization. On another occasion, in the area in which the Turks

had defeated the Greeks, the natives thought they must murder an Englishman, and selected a telegraph superintendent of Indo-European Telegraphs. I was with the punitive expedition which drove the murderers out of their village, and later I was sent to the village of Ramishk to try to get behind them. In those days the country was entirely unexplored. I found that the murderers had camped and were grazing their cattle within a few miles of the village of Ramishk. The headmen of the village came to me and said they were going to cut my throat. I thanked them for telling me, and asked if they knew what was the penalty for killing a Consul. They replied that they did not, and I said, "One hundred of your heads will have to be handed over to the Minister at Tehran, and there built up into two columns; the Minister will come out and see them and his heart will be gladdened." As a result the people seized the chief and later he was hanged on a very high telegraph post at Jask.

I also travelled in Makran on the Persian–Baluchistan Boundary Commission with Sir Thomas Holditch, whom I emphatically state was the greatest boundary-maker we have ever had. The number of boundaries he laid down far exceeds anybody else's record. I conclude by saying that when one mentioned Baluchistan to a Persian in the old days he would ask: "Do you know the proverb? When the Almighty created the world, out of the pieces of refuse he created Baluchistan."

Dr. HUGH SCOTT: Some of the views of the western part of the area described by Dr. Harrison bore an extraordinary resemblance in topography—it may be only superficial, I do not know the geology well enough to say—to parts of the broken mountains and foothills in the Aden Protectorate between the low coastal desert (the Tihama) and the real Yemen highlands. One or two photographs surprised me by the startling resemblance to scenery which I knew there, notably the fantastically-shaped crags and pinnacles shown during the early part of the lecture. In the Aden Protectorate however these features consist of volcanic peaks rising to 7000 and more feet above sea-level.

In regard to the vegetation, the fan-leaved palms recall the doum-palms (*Hyphaene*) which, in parts of the Aden Protectorate, are found from the very sea-beaches to some hundreds of feet above, but then cease. Here again however the likeness is superficial, and the fan-leaved palms in Dr. Harrison's photographs evidently grow at a much higher altitude. I thought that I also detected a second kind of wild palm, not of the fan-leaved type but a scrubby bush date-palm, possibly identical with or closely related to, *Phoenix reclinata* which I saw in the wadis of south-western Arabia at altitudes between 2000 and 5000 feet; but I could not be quite certain from the photographs.

The sarong-like garments, worn by some of the people shown, resemble the kilt-like garments called by the Aden Arabs "futas." Some of the types of houses also were strikingly like those which I have seen, especially the round type with the thatched roof. This recalled the "tukuls" of the Abyssinian highlands. I would like to ask whether the valleys in the Makran Coast region are malarious? Valleys of a corresponding type in south-western Arabia would be infested with a virulent form of malaria.

My final question arises from ignorance of political boundaries. Does all that country of the Makran Coast belong to Iran, or does a small part of it belong to the Sultanate of Oman, across the sea?

Dr. HARRISON: As far as Persian Baluchistan is concerned it belongs entirely to the Iranian Government. The part to which Dr. Scott is referring is just across the border in British Baluchistan where there is a small semicircular patch which belongs to the Sultanate of Muscat. As to the prevalence of malaria, the population is exceedingly sparse, and so far as I know malaria is not very

prevalent. I did a good deal of doctoring among the people, and saw very little malaria. Guinea-worm, so prevalent around Bandar Abbas, does not extend down the coast, so far as I know.

I should like to say how much I appreciated Sir Percy Sykes' remarks and to tell him that there is one phrase in his book on Persia which has remained in my memory: That he who would travel in the Makran must be imbued with infinite patience. I have no patience at all, but Agha Nasrullah Mustofi, the friend with me, supplied that infinite patience which made our travels possible and at times pleasant.

The CHAIRMAN: We must again thank our lecturer for his most interesting account of the Makran Coast. I am certain we have all enjoyed it and that the many more than hundreds who will read the account in the *Journal* will equally enjoy it.

THE RÔLE OF PEASANT HUNGARY IN EUROPE

MISS HARRIET WANKLYN

Meeting of the Society, 18 November 1940

THERE are two conceptions of geographic influence on the political and economic development of any human group. The first is that which can be seen at the present time, the effect of environment considered under the various headings of position, physical features, climate, soils, and resources. The second is less easy to grasp but equally important. One must try to visualize the cumulative effect of geographic influence over the course of centuries, for therein lies one clue to the psychology of many political groups. The indirect and long-term effects of geographic circumstances are, moreover, particularly significant in the study of a people whose history has been that mainly of dependence on the land.

For these reasons it is difficult to write about any topic concerning Hungary without the preamble which one would so gladly avoid. The geography, history, and economics of Hungary to-day have little significance unless they are studied in relation to the long record of the fortunes of the Magyar people and their subjects in the Old Kingdom. The present condition of the rural working class in Hungary, and its position in the troubled Europe of our time, are explicable only as a phase in the long history of agrarian problems in the central and eastern parts of the continent.

There are three aspects of the history of Hungary which have a special bearing on the present circumstances of the peasants.

The first is the traditional association in general feature, if not in precise detail, of the region of Magyar predominance with the geographical area of the Middle Danube Basin (Fig. 1). Magyar mastery of this part of Europe was achieved in the eleventh century, and maintained until the Turkish occupation five hundred years later. After the Turks were thrust out, the Kingdom of Hungary within the Hapsburg Empire had roughly the same frontiers as the medieval unit, and these were held again until twenty years ago. The importance of this long association between geographic features and political frontiers is not lessened by the fact that the population within them was always heterogeneous in language and culture, creed and occupation, nor by the truth that, except in the Transylvanian Basin, the settlement area of the predominant Magyar group was confined to the Alföld lowland and the broken country of Trans-Danubia.[1] These two names perhaps deserve comment in passing. The word Alföld means "plain," and refers in Hungary to the region between the Danube and the Transylvanian Highlands. The smaller area of lowland north-west of the Bakony Hills, between Esztergom and Bratislava, is known as the Little Alföld, in contrast to the great plain. The term Trans-Danubia, applied to western Hungary, is a reminder that the Magyars at the end of the ninth century entered the Middle Danube Basin across the Carpathian passes from the north-east, moving westward to conquer and settle the lowlands.

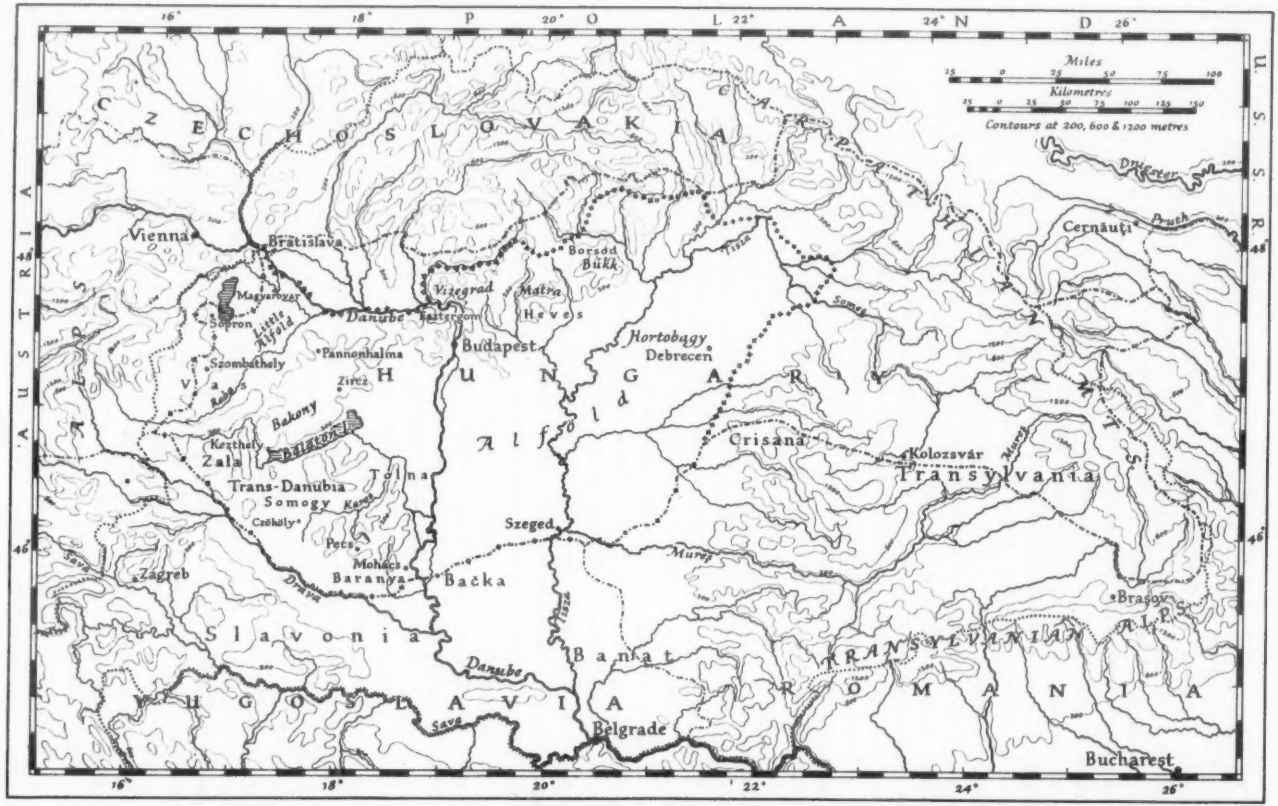
[1] See map illustrating the distribution of nationalities in Hungary, *Geogr. J.* 47 (1916) 240.

The characteristic of continuous and determined connection with a definite geographical area is evidence in part of the peculiar nature of the Magyar people. They were the first group who were able not merely to raid but to hold the attractive regions of the Middle Danube Basin which had seen pastoralist invaders in quick succession between the third and the ninth centuries. Moreover, in spite of the destruction accomplished by the Turks and the century and a half of Ottoman domination, no people has in the course of eleven hundred years challenged the fact of Magyar ascendancy in the Middle Danube lowlands. If not always the rulers of this region, the Magyars have at any rate persisted as the most notable group in it. They seem to possess remarkable strength in maintaining their identity and a vigorous power of absorbing a good proportion of the alien elements around them and in their midst: indeed they recall in this the Berbers of the Atlas Highlands, of whom Mommsen aptly wrote: "the Phoenicians and Romans have been swept away, but the Berbers have remained like the palm trees and the desert sand."[1]

The long tradition of the Old Kingdom, and the fact that a Magyar state implied for centuries the mastery of non-Magyar groups, explain the attitude of the whole Magyar people towards the circumstances of the past twenty years in Danubia which may well have seemed to the dominant group of the Middle Danube Basin the breach of a "divine right." This intransigeance of the Magyars has two aspects. One has been easy to understand: the exclusion of Magyar-speaking populations from the Regency, which is plain from a comparison between ethnographic and political maps for the period 1921–38, could never be accepted with resignation in Hungary. This grievance has however been removed in part by the various readjustments of the northern and north-eastern frontiers of Hungary since the autumn of 1938. The other sense of injury in Hungary is comprehensible only in the knowledge of the past history of the Magyars and of their traditional sphere of influence. In considering this problem, one must remember also the distinction between the terms "Hungarian" and "Magyar." There is one name, Hungary, for the country, whether one has in mind the Old Kingdom, the Regency of 1921–38, or the recently expanded unit. But Hungarian applies to the heterogeneous population in the Old Kingdom or in the Regency since October 1938 (Magyars, Slovaks, Ruthenes, Rumanians, etc.). Magyar refers only to the dominant group within the country.

The second feature of the past history of Hungary which is still apparent in its effects is that of the actual Turkish invasion followed by the period of Turkish mastery. The devastations of the Ottoman armies and the misrule of the Turkish pashas marked indelibly all the regions of Magyar settlement except two: the remoter highlands of Transylvania, and the north-western part of the Middle Danube Basin beyond the barrier of the Bakony and Visegrad Hills. Every form of peasant existence was affected by this disaster, and the traces of it are plain, especially in the country east of the Danube (Fig. 2). The Turks were directly responsible for the radical altering of the pattern of settlement and of the predominant type of occupation: they were indirectly answerable also for the haphazard colonization schemes of the eighteenth and

[1] C. H. Becker, "The expansion of the Saracens," 'The Cambridge Medieval History,' vol. II, chapter 12, p. 365.



Kingdom of Hungary 1867–1919 ..... Frontiers of the Regency 1919–1938 ••••••• Existing frontiers ——.——.——

nineteenth centuries, which trouble Slavonia, the Baranya, the Bačska, and the Banat to-day in the form of an acute linguistic fragmentation.[1] The entry of the Turkish armies into the Middle Danube Basin brought about the destruction and flight of a large part of the Magyar farming population, particularly in the east and south. A hundred and fifty years later the successful campaigns of the Hapsburg armies, which drove the Turks out of this region, created for the second time a vacuum in the settlement and exploitation of these farming lands. In both cases the abandoned areas were filled with non-Magyar immigrants. In the earlier movement Serbs and Rumanians were noticeable: in the later the South Germans.

Thirdly, it is never forgotten in Hungary, and with reason, that the Hapsburgs were the inheritors of the Turks in the Middle Danube Basin. Even though the equality of Hungary with Austria within the Empire was officially recognized by the famous agreement of 1867, the Magyars could never shake free from the long period of Hapsburg domination in the past nor from the contemporary influence of rulers in Vienna. From the point of view of the majority of the inhabitants of Hungary the most important result of this association with the Emperors was a peculiar form of economic development in the Old Kingdom. There were, in the traditional territories of Hungary, sufficient resources in bulk and variety for the building up of a well-balanced economic existence. Admittedly the wealth in minerals, timber, and water power lay mainly outside the Magyar lands, and to use these assets it was necessary to draw on non-Magyar groups for labour; but the necessary elements for a good interdependence between farming and industrial activity were present and the geographical distribution of the raw materials was not a conscious problem until the later stages of industrialization. The difficulty lay in the clash between Hungarian interests and those of the whole Empire. From the point of view of the Hapsburg rulers industrial activity was sufficiently represented by the growth of Czech and German enterprise in Bohemia, and by the many-sided manufacturing and commercial existence of the great Austrian capital. The Emperors could not help envisaging the improvement of the great farming resources of Hungary as a more satisfactory form of economic advance than the prospect of competition from Slovak or Transylvanian industry. Moreover the Imperial point of view was, to a certain extent, explained by the attitude of the Magyar landowners. For one thing, owing to the development of the market for farming products within the frontiers of the Empire and farther afield, during the rapid industrialization of the nineteenth century, the owners of the large estates were loath to lose a cheap and abundant supply of peasant labour to the factories and mines even of Hungarian territories.[2] For another, the Magyar nobles, by insisting on their constitutional right of exemption from taxation, prevented Hungary from making the contribution to the economy of the Empire which would have been in keeping with the rapid changes in nineteenth-century Europe. Thus, first because of the Hapsburg policy of specialized production within the Empire, secondly because of the commercial opportunities for the great

[1] See map illustrating the distribution of nationalities in Hungary, *Geogr. J.* 47 1916) 240.

[2] See C. Macartney, 'Hungary and her successors.' Oxford: the University Press, 1937, pp. 26–34.

landowner, and thirdly because of the peripheral distribution of the raw materials in the Old Kingdom, the industrial growth of Hungary up to 1914 was stunted in proportion to her natural resources. The acknowledged freedom of the Magyars after 1867 to control their own economic development had made a certain impression on Hungary by the time that war broke out in 1914, but had not by any means succeeded in catching up the time lost in the earlier part of the nineteenth century. Thus the Magyars on the outbreak of the last war found themselves with two conflicting aims as a national group. They longed for total independence of Austria, and saw as one means to this end the development of a varied economy in which industry must play an increasing part. But on the other hand the most powerful political element in the country, the landed aristocracy, maintained their resistance to taxation, and could not but dread the toll which such new ventures in industry must take of peasant labour.

In many ways this dilemma was aggravated by the revolution in Magyar existence which accompanied the peace treaties. Much of what had been regarded as entirely vital to Hungarian industrial growth was lost to the Magyars, but for a variety of reasons the process of industrialization in truncated Hungary continued,[1] and whereas in the past there had been considerable reliance on the non-Magyar populations as factory hands, after 1920 the whole effort depended upon Magyar labour. Industrial interests, whether they stimulated or competed with farming production in the Regency, were bound in time to hold an acknowledged position in the economy of the Magyars, but on account of past distractions they were late to develop, and the possibilities of manufacture in this country have had a somewhat grudging acceptance in Danubia.

For the half of the Magyar population which remained dependent upon farming as an occupation (approximately four million in 1920), there was a series of sharp fluctuations in economic prosperity which are too well known to need any but the shortest comment. The Magyar farmers, whether peasants or magnates, achieved some recovery after the chaos of the years following the war, thanks in part to the administration of an international loan. This period of comparative prosperity in the post-war world was succeeded by the bleak years between 1930 and 1934, and the Magyars were no exception in their dire distress to the whole agrarian population in Central and Eastern Europe. The recovery which succeeded the depression was tempered in Hungary as elsewhere by the growing sense of insecurity in Europe owing to the ominous course of political events in Germany.

The Magyars have certainly had cause for anxiety, since their economic difficulties, their social inequalities, their aspirations, and their grievances in foreign policy have been closely watched by the Germans. Indeed, the German "set" at Hungary has been as systematic as that at Austria, Czechoslovakia, or Poland, although because this particular aspect of Nazi activity has not culminated in open hostilities or in outright annexation, it has not attracted very much public attention abroad.

Given the German insistence on controlling at any rate the central and

[1] See 'South-eastern Europe.' (Compilation by the Royal Institute of International Affairs.) Oxford: the University Press, 1939, pp. 115–6.

east central regions of the European continent, the importance of the Magyar group to the Third Reich is not difficult to explain. In geographic position the Magyar lands are vital from the point of view of German strategic communications, whether for the mastery of the Slovak, the Rumanian or the South Slav settlement areas. Economically, it is scarcely surprising that the Germans should regard the grain, root crops, and pastoral products of the Hungarian farms, as well as the huge supplies of bauxite,[1] as the pre-ordained supplements to the needs and organizing ability of the Third Reich. It would be hard for them also to resist the temptation to exploit resentment of the Treaty of Trianon, long harboured by the Magyars, in the interests of their own increasing necessity for further bases from which to dominate south-eastern Europe. Finally the gathering forces of agrarian unrest in Hungary itself in the years preceding the present war offered a unique chance for German manipulation.

But the last-named threat to Hungarian solidarity can mean little, especially to geographers, without some allusion to the natural setting in which these disturbances developed. Political and economic studies of the Magyar farming population miss their mark if made in ignorance of the very sharp regional contrasts within the area which is generally known as the "Middle Danube Lowland."

Few people are aware, for example, of the great dividing line in Hungary which is made by the Danube in its course between Budapest and the point of confluence with the Drava (Fig. 1). It is usual in modern times to regard a waterway as a unifying rather than a dividing force, and yet the fact remains that the great river separates two very different kinds of rural existence. To the east again, the Tisza tributary, which flows roughly parallel with the main stream, forms a second but less remarkable frontier in agrarian Hungary.

Western Hungary is lowland only in comparison with the high mountain ranges which form the outer rim of the Middle Danube Basin. Any traveller making his way from Sopron in the north-west of the country to Mohács near the present Hungarian–Yugoslav frontier would be struck by the alternation of hill and valley, even though the ridges are of no great height. He would first cross the Raba Basin to the Bakony Hills, to descend again to the Balaton Lake. He would cross the hills which separate the lake from the Karos Basin, and then make a third climb into the high ground of Somogy and Tolna counties before arriving at the great lowlands in which the Drava and Danube rivers join (Fig. 1).

In this broken country there is considerable variety both of landscape and of farming economy. Agriculture and pastoralism have here very long traditions and definite features which are worth attention.

The Bakony Hills, and those in the angle between the Drava and Danube rivers, are valued in the Magyar lands because their higher slopes are abundantly wooded with beech and oak. Together with the upland counties of the north, Heves and Borsod, where the economy of the west is carried beyond the Danube, these regions provide the timber which is noticeably scarce in the

[1] The bauxite resources of Central Hungary form the main mineral wealth of the Middle Danube lowland, and rank second among the countries endowed with this raw material.

Magyar settlement area. It is not surprising to find, either, that these forested hills formed the refuge of the Magyar peasants in the days of the Turkish invasion.

The quality of the soil has been a direct encouragement to agriculture in much of this part of Hungary, especially in Tolna and Somogy, although this natural wealth has brought its own problems in the form of a too energetic clearance of the woodland. Many districts have a reputation for specialized forms of farming production. The south-eastern valleys and lowlands bear big crops of wheat, maize, and oats; the cultivated slopes which border the woodlands are famous for their vineyards; the Raba Basin is noted for its sugar beet, and for its fruit orchards; the counties of Somogy and Tolna for horse-breeding; the south-western counties of Vas and Zala for cattle rearing.

The rural population, which is responsible for these forms of farming activity, needs further comment. Farming settlement in this part of the country stretches back into the early days of European history. The villages and country towns are of long standing and their inhabitants have gathered in the course of centuries a vast accumulation of custom and tradition. In some districts, for example, Sárkoź in Tolna and Ormánság in Baranya, there is evidence that the peasants are of an occupation preceding the Magyar, although these ancient groups have been absorbed by the majority population. In Czököly again, in the county of Somogy, the inhabitants are possibly a remnant of the Tartar horde which swept through the Middle Danube Basin in the thirteenth century, and of which a few remained to adopt the practices of settled farming established in Trans-Danubia.[1]

Trans-Danubia is the stronghold of the "great estate"; and the existing population lives according to a deeply rooted hierarchy which owes its form largely to the existence of these large properties, whether owned by one individual or by powerful bodies such as the abbeys at Pannonhalma and Zircz, which control a considerable part of the Bakony region. The definition of a great estate is difficult since plainly there is no automatic correlation between the extent of a property and the wealth and social position of the owner. There are so many factors to be taken into account: physical features, climate, soil, tradition, farming technique, supplies of capital, markets. Ancel in his 'Manuel de la Géographie Politique Européenne'[2] has taken the figure of 1000 hectares as the lower limit of a great estate. He mentions the following properties as outstanding instances of *latifundia* in Hungary in 1918, although he admits that these estates have been "trimmed" by frontier revision and by the land reform laws of 1920 and 1924: Magyarovar in north-west Hungary, 11,500 hectares; that of Prince Festetics at Kezthely, 50,000 hectares; that of the Esterhazy family near Sopron, 60,000 hectares.[3]

The strength of the land-owning class naturally implies complementary strata in the peasant population.[4] Large numbers work as servants on the landed estates and enjoy a certain security of employment, even if the oppor-

[1] See E. D. Beynon, "Isolated racial groups in Hungary," *Geographical Review*, 1927.
[2] Ancel, *op. cit.*, vol. I, "L'Europe Centrale." Paris, Librairie Delagrave, 1936.
[3] *Ibid.*, pp. 389–93.
[4] See E. D. Beynon, "Migrations of Hungarian peasants," *Geographical Review*, 1937.

tunity to rise in the economic or social scale is limited. Their position would deteriorate only with a sudden development of agrarian reform. In addition, there is the even bigger group of landless labourers who are distinct from the regular servants of the estate and whose prosperity is bound to vary with the abundance or scarcity of farm production and with the home or foreign market for Hungarian grain or sugar or meat. There is also in the west the dwarf landowner or peasant whose personal property is too small in acreage or too poor in productive capacity to maintain himself and his family, and who is obliged to eke out his means by labour on more prosperous farms. It is geographic position, that is to say the effect of proximity to Austria, rather than of a conservative social and economic system, which makes Trans-Danubia also the stronghold of Catholicism in the Magyar lands. This part of Hungary experienced most fully the force of the counter Reformation in the sixteenth and seventeenth centuries.

While the types of land-ownership and land-tenure in Trans-Danubia cannot but arouse comment, it is equally necessary to point out the standing of that part of Hungary in European farming as a whole. The land between the Austrian Alps and the Danube is reckoned as a sort of border country in the methods of cultivation and pastoralism obtaining in the continent.[1] It is the eastern frontier zone of intensive exploitation of the land supported by adequate capital and a reasonably high technique on the part of the peasant labourer; and it is significant that one authority on peasant farming in Europe considers that the rural economy of Trans-Danubia is more intelligently discussed alongside that of Bohemia than in relation to agriculture and pastoralism of the Magyar lands east of the waterway.[2] This does not imply that there is no necessity for change in the agrarian system of Western Hungary, and there are many examples of peasant farms in Trans-Danubia whose methods of production appear as primitive as those farther east; but although the tradition of the yeoman and the enterprising pioneer belongs to the Alföld, many of the characteristics of east European farming make an unmistakable appearance beyond the Danube.

It is difficult to exaggerate the value of the Trans-Danubian region to the Magyar group. It has provided alike some sort of security and a fair return for effort for a people who in the course of history have had their full share of buffeting. From the broken country of the west where existence had had some continuity, and from the hill regions of the north, the Magyar farmers in the nineteenth century set out to win back for agriculture the difficult, sparsely populated country of the Great Plain.[3] One might add in conclusion that Hungarian farming seen in its geographic setting should lead to a revision of opinion about the "typical Magyar." The wild horseman of the *puszta* never at any time represented more than a small group in the Magyar lands. The majority of the farming population now in the Alföld depends on agriculture rather than on pastoralism, and the herders of the north-east are the survivors

[1] See D. Warriner, 'The economics of peasant farming,' p. 98. Oxford: The University Press, 1939.

[2] Warriner, *op. cit.*, p. 102.

[3] See E. de Martonne, 'Géographie Universelle,' vol. IV, L'Europe Centrale, Part 2, p. 515.

of a past economy. The great fame of the plain in farming production is also due as much to the sturdy immigrants from the regions with a more favourable tradition in cultivation as to the learning of a more advanced economy by the older inhabitants of the Alföld.

In most respects the country between the Danube and the Tisza offers an impressive contrast to that farther west. Here the changes in relief are due only to details in the landscape, the low but steep, sandy cliffs which overhang the Tisza in summer drought, and the rise and fall of the dunes. Here the only woodland cover is that of the acacia plantations, laboriously encouraged in order to fix the shifting sand, and the willows which follow the river courses. Here also, as though to offset the monotony of relief, the inhabitants of the plain are faced with climatic conditions and with a river

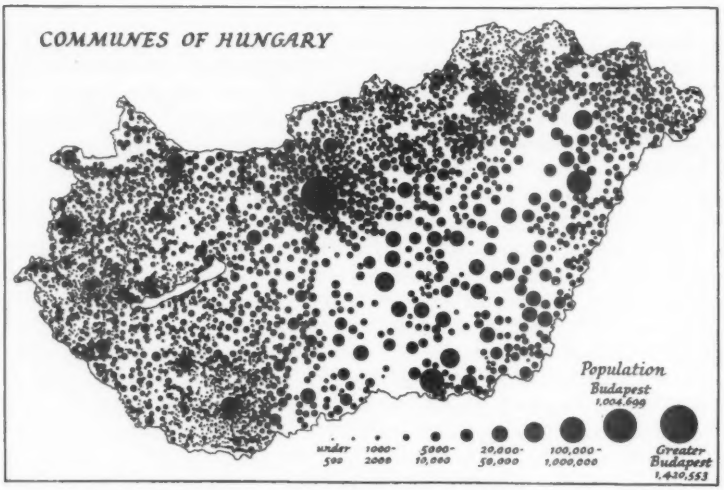


Fig. 2. After G. Thirring, Geographical Review, 1937

system which are famed for their extremes of violence. The Alföld farmers must adjust their economy to almost freakish circumstances of winter cold and summer heat, to spring floods of an appalling force in the neighbourhood of the Tisza and also to autumn drought, to sudden storms of snow, battering rain, and whirling dust. While the Danube plainly does not form a sharp climatic divide between east and west in Hungary it is also clear that the unbroken lowland of the Alföld with its peculiar hydrography is more liable to devastation from natural causes than the hills and valleys of Trans-Danubia. A Scottish traveller of the nineteenth century, A. J. Patterson, pointed out the effect of the constant struggle with an erratic climate and an ungovernable stream on the Magyar peasants who had attempted for generations to secure their living from the soil. He writes: "The fertility of the soil combined with the uncertainty of the climate gives agriculture a gambling character. The peasant is thus exposed to greater temptations to idleness

than elsewhere. With scarcely any exertion on his part, a favourable season will bestow on him a crop far exceeding the expectations of the husbandman in less fertile countries; on the other hand, all the labour he may bestow on his fields may be rendered of no avail whatever by a few hours of frost or a few days of drought." [1]

In the Great Plain, three generations of rural settlement are traceable. The form of the earliest, preceding the Turkish invasions of the sixteenth century, has been blotted out by the effects of the Ottoman occupation and by those of modern pioneer farming. As far as we can tell it was predominantly agricultural rather than pastoral.[2] The scattered groups of medieval farmers must have learned by the process of trial and error to distinguish between the fertility of the loess soils and the barrenness of the sands, and to have recognized the areas which were free from seasonal flooding.

The succeeding pattern of settlement and the accompanying economy which are still plain enough in the Alföld are directly attributable to the Ottoman invasion and settlement. Isolated farms disappeared by reason of the continued fear of attack, and the surviving rural population gathered into the immense village towns which are the dominating landscape feature of the Alföld countryside. Out of this movement towards great rural nuclei, a curious form of municipal land-ownership arose (Fig. 2). For the same reason the mobile form of farming wealth, the flock of sheep and the herd of cattle or horses, was preferred to the more vulnerable crop. Accordingly the earlier impression of the agriculturalist on the loess lands was lost, except in the immediate neighbourhood of the village towns, and the greater part of the Alföld reverted to the *puszta* or natural steppe.

With the growth of commercial possibilities for shrewd farming in the latter part of the nineteenth century, the Alföld economy underwent a further change. Enterprising peasants broke away from the great agglomerations to work the loess steppe in isolated farms, immigrants began to trickle in from Trans-Danubia and, with greater timidity, some non-Magyar colonists, Slovak, Ruthene, and Rumanian, made their appearance on the fringes of the plain. When the achievement of regulating the Tisza floods was certain the triumph of cultivation over pastoralism in the Alföld was assured. Not only a greater extent of the loess lands, but also the wide stretches of alluvium were made accessible to the farmer by the dyking of the river and the clearing of the bordering marshes.

The Alföld changed therefore in two generations from an area of limitless grassland to one of varied agriculture. Wheat, rye, and maize predominated in the loess lands, and the sand-dune wastes were planted with vines and acacias. Except in the neighbourhood of the famous peasant city of Debrecen where the old pastoralist economy survives even to-day, and in the riverine lands which could not be secured from flooding, the proportion of pasture land to the whole in the Alföld had dropped by 1914 to as little as one-fifth.

Yet in spite of this type of agrarian revolution a hierarchy developed in the

[1] A. J. Patterson, 'The Magyars: their country, people and institutions,' vol. I, pp. 159–60. London: Smith, Elder, 1869.

[2] See E. D. Beynon, *Geographical Review*, 1937.

Fig. 3. Distribution of Latifundia in 1913; redrawn, with additions, from 'Hungary before and after the war in economic–statistical maps'

Alföld rural population which is still extant. It is different from, but in many ways no less rigid than, that of Trans-Danubia. The great estate, although present, is not here the predominant form of landownership. Pioneer settlement in the late nineteenth century established the small farmer firmly in circumstances ample enough to ensure his economic survival and to make him, up to a point, politically articulate [1] (Fig. 3). At the same time it was difficult for peasants without some financial backing to escape from the domination of the town organizations. That many made this effort with a moderate degree of success is shown by the extent of "tanya" farms in the Alföld to-day. This term is applied to the isolated plots of land with dwellings attached which have grown up on the periphery of the great peasant communes.

It is interesting to see that the Alföld farming groups whether in the peasant cities or in the pioneer settlements are often Calvinist. The strength of reformed religion in Hungary is often forgotten, and the main upholders of it are the Alföld farmers. The rigid performance of religious practice exacted by the town authorities was indeed one deterrent to "tanya" settlement: would-be emigrants were now and then suspected of wishing to evade a rather burdensome system of devotions and were refused permission to try their luck away from the community.[1]

American scholars, and especially Magyars settled in the New World, have sometimes compared the extensive farming system which developed on the Alföld to meet the needs of European industry, with that of the wheat belts in the United States.[2] The suitability of such an analogy is limited, but it is not surprising that emigrated Magyars have always in remembrance the lower yields, the greater extravagance with the land, and the dependence on communications for a distant market, which obtain in Hungary east of the Danube, and which make so great a contrast with the economy of Trans-Danubia. At the same time it is worth noting that the yields of grain per hectare in the Alföld, achieved with a negligible extent of mechanization and a limited knowledge of agricultural chemistry, do not compare unfavourably with those of the famous cereal regions in the United States, Australia, and the Argentine, while the yields reckoned for Trans-Danubia alone are much higher than those of the New World. For purposes of comparison, the yields of wheat in quintals per hectare for the following countries are interesting: Germany, 27·4; Great Britain, 25·6; Hungary, 16·6; Trans-Danubia, 15–20; East Hungary, 11–13; Rumania, 12·6; Argentine, 11·8; U.S.A., 8·9.[3]

East of the Tisza there is again a variation in farming economy, although it is not so striking as that between Trans-Danubia and the western Alföld. On the frontiers of Rumania there is a return to the large estates and an attention to grain production which seems almost excessive (approximately 70 per cent.

[1] The interests of the rural population in Hungary, apart from those of the great landowners, have been represented, without very conspicuous success, by the Small Farmers' Party. This could not accurately be called a peasant party. See E. D. Beynon, *Geographical Review*, 1937. A second yeoman farmer element in the Regency is found in south Hungary, but many of the prosperous owners of medium-sized estates in this part of the country are German in origin.

[2] See D. Warriner, *op. cit.*, p. 98.

[3] From *The international year book of agricultural statistics*, 1938–9. Rome: The International Institute of Agriculture.

Fig. 3. Distribution of Latifundia in 1913; redrawn, with additions, from 'Hungary before and after the war in economic-statistical maps'

of the land is under cereals). This is partly accounted for by the unbroken extent of the loess soils, but in spite of their high quality the yields of grain are not remarkable.[1] In recent years the increase of the area under maize and a proportionate decline in the wheat-land have a rather ominous meaning. The additional maize is grown not for fodder but for human consumption, and betokens a decline in the standard of living. It is analogous to an increase in rye over wheat in northern Europe.

Although the Danube and Tisza rivers in Hungary may form major and minor frontiers between lands of contrasting agrarian tradition and practice, there are some characteristics which are common to the whole Magyar settlement area, and which distinguish this people from their neighbours.

One feature is the comparatively low birth-rate in many farming districts. There are sharp variations between different regions, but the increase of the peasant population in Hungary is noticeably lower, for example, than that in Poland, Slovakia, Rumania, Bulgaria, or Yugoslavia. It is more comparable to that of Bohemia and Moravia.[2] This circumstance has a noticeable bearing on the agrarian problem. It is perfectly true that in several regions of Hungary there is undue pressure on the land, but the total area in the country of soil of reasonable farming quality, compared with the whole population, gives a remarkable average of productive land per head, higher than in any neighbouring group. There are 1·7 hectares of land per head of farming population and 1·2 hectares of arable land. This point must come up again in thinking of the future of the Hungarian peasant.

The second feature which needs comment is that of the status of the peasant population. It did not change, economically, socially, or politically after 1920 through the medium of Land Reform as in the surrounding "successor" countries. Change is perhaps a more accurate term than "advance," as it must be admitted that the Agrarian Revolution of the years after the 1914–18 War had in effect many drawbacks, whatever the sincerity of the original aim. But whereas in Czecho-Slovakia, in Yugoslavia, and in Bulgaria, the governments of the 'twenties bent all their energies to limiting the *maximum* size of the farming properties, the Regency in Hungary aimed, without very conspicuous success, at fixing a *minimum* area for peasant-owned land in the hope of reducing the uneconomic dwarf plots. It is difficult to deny that in the "successor" states the agrarian changes gave the great peasant element in their populations an increased dignity and solidarity, even if the total of farming productivity in these new countries dropped in the years following the Revolution. But in two countries, to a great extent in Hungary and to a lesser one in Poland, the pre-1914 circumstances in the possession and tenure of land remained undisturbed.

[1] See E. de Martonne, 'Géographie Universelle,' vol. IV, Part 2, pp. 520–1.

[2] See Warriner, *op. cit.*, pp. 45–7, and also G. Thirring, "Hungarian migrations of modern times," *International migrations*, vol: II, Ed. Willcox, New York, the National Bureau of Economic Research, 1931. Thirring mentions the shortage of labour felt between 1905 and 1913 in the Old Kingdom of Hungary, and the attempts made by the Government at Budapest to check the vigour of Magyar emigration. Beynon in the *Geographical Review* of 1927 mentions the deterioration of the farming land in some of the villages in Hungary, whose inhabitants belong to isolated racial stocks, owing to an excessively low birth rate.

It is not difficult to see why these two peoples should have differed in their attitude to agrarian reform from the surrounding groups. In the first place, in Austrian and Russian Poland and in Hungary the native aristocracy persisted as a vigorous section of the population to whom Polish and Magyar peasants had looked for centuries for political leadership. The nobility in the Magyar and Polish settlement areas were thus in a very different position from the Balt landowners in Estonia and Latvia, from the Austrians in Bohemia, and in the case of the Magyars, from their own kin who had estates in Slovakia or Croatia-Slavonia. Magyar and Polish peasants might feel keenly the retention of archaic political and social conditions in contrast to the altered position of the Slovaks, Ruthenes, and Croats, but there was no setting in these countries for the drastic changes in land ownership which took place in so much of Central and Eastern Europe. The position of the Slovak and Ruthene peasants in Czechoslovakia is a vexed and complicated question; but clearly there must be two gauges of the success of peasant proprietorship. By that of material prosperity and technical efficiency (probably sought through co-operative societies) much, but not all, peasant farming in the last generation must have fallen short, in method and production, of pre-1914 large-scale farming standards. The other test is that of psychological satisfaction in a changed social status, and though many of the peasant farmers in the "Successor States" were little better off materially than they were before 1914 they appreciated the different standing given to the peasant element by drastic agrarian reform. But there was also in Hungary a further reason for the delay in the redistribution of land. All classes in the population, landowners and peasants, town dwellers and countrymen, with the exception of a very small minority, looked back with horror to the time of the short Communist regime of Bela Kun in 1919, which was associated with economic chaos and national humiliation. The utter failure in Hungary of the Left-Wing governments which had followed the collapse of the Empire put an end for an indefinite period to the possibility of progressive policies in the Regency.

It is true that the Parliament in Budapest was responsible for agrarian legislation in 1920 and in 1924, which was itself an admission that there was need for reform. It is true also that the last twenty years have brought a greater recognition among the nobility of the need for a fresh policy towards the peasantry than is apparent in the administrative history of this period. Yet the measures suggested to improve peasant farming seem but an apology for real agrarian reform. The laws were too gentle to the great landowner to meet the evil of excessive inequalities in property ownership; and, further, the actual measure of reform was even less effective than that planned by Parliament. Moreover the mere division of land, far-reaching or limited, is only one step to successful peasant proprietorship. If there are not the accompanying financial and educational facilities, the effect of changes in land ownership is greater hardship, not less.[1] The failure to follow up such redistribution as took place with the necessary economic support for the new small owner was plain in Hungary, and the results distressing. In 1930, when the economic depression began to be felt acutely, the contrast between the position of the magnate and

[1] See E. D. Beynon, *Geographical Review*, 1937.

that of the landless or landed peasant in Hungary was nearly as glaring as it had been ten years earlier.

During the years of the slump the penalty for having ignored the need for land reform became apparent. The great property owner suffered very severely, as was natural, from the decline in agricultural prices on home and foreign markets, but he was not destitute. The dwarf landowner, and the agricultural labourer, whose work was no longer needed owing to the contraction in farming activity, were in desperate circumstances, despite the fact that the state attempted to rescue both landowner and peasant. When the depression was at its worst it was reckoned that something like 2,000,000 small farmers were obliged to admit failure and that 1,000,000 landless peasants were out of work.[1] One must bear in mind that this picture is drawn of the blackest time, and that economic recovery in Hungary was partially achieved by 1937. But the years of economic crisis had had far-reaching effects. They had set the stage in Hungary as in the other predominantly peasant countries in Europe for German economic penetration, unique in its methods, in its violence, and in its effects. It has also become clear to the Nazi element in Germany, which was growing every year in strength, that there was a degree of social unrest amongst the Magyars, largely derived from the bitter experiences of the small farmers and the landless labourers, which could be exploited as occasion demanded.

By the early summer of 1938 it was plain that, with the exception of Bulgaria, there was no country in Europe more tightly in the economic clutches of Germany than Hungary.[2] The need to find a market for her surplus farming products had driven her farmers ever since the establishment of the Regency to maintain the old trading link with Vienna, and to develop another with Germany. This tendency to trade with the German speaking peoples was encouraged by the tariff policy of the Czecho-Slovak agrarian party, which after 1929 sought to protect Czecho-Slovak farming by checking imports, and thus destroyed the traditional Hungarian market in Slovakia and Ruthenia. When the Anschluss was achieved by Germany in the spring of 1938, it meant that over 40 per cent. of Magyar exports were going into territories under Nazi control and that about the same proportion of imports were being drawn from them. After the change in frontiers resulting from the Munich Agreement the export figure was increased to over 50 per cent., since those Magyar markets in Czecho-Slovakia which had survived had been mainly developed to feed the industrial population of the Sudetenland. Such a degree of economic attachment to the Third Reich, and the immediate proximity of that Reich on the western and northern frontiers of Hungary was a high price to pay for the recovery of non-Magyar lands in the north.

The Nazi government in Germany was not only interested in the grain and meat and sugar of Hungary. Its watchful eye, turned upon the millions of peasant producers, saw among a certain section of them fertile ground for propaganda. The domestic Nazi party in Hungary drew a large part although

[1] See *The Economist*, 14 May 1938.

[2] See Chambers, 'Report on economic and commercial conditions in Hungary.' London: H.M. Stationery Office, 1938.

not all of its support in 1938 and 1939 from the disgruntled element amongst the dwarf landowners and the landless labourers, and the German press in the early months of 1939 was commenting on a National Movement "of the masses, quite unlike the old Parliamentary Clubs." [1]

It was inevitable also that the Magyar peasant should learn something from the return of parts of Slovakia and the whole of Ruthenia to Hungary. Even if this were a matter of national rejoicing, it also meant that the northern Magyars were able to see something of the effects of intelligent agrarian reform and of conscientious Czech administration in Slovakia, and to draw their own conclusions. As has been pointed out above, it is difficult to speak definitely of the success or failure of Czech agrarian policy in Slovakia and Ruthenia between 1919 and 1938. But whatever the defects of the administrators from Prague, lack of zeal and inefficiency were not amongst them. On the other hand the Magyars in the Regency might well draw entirely different conclusions about the benefits of land reform, with the return to Hungary of northern Transylvania. An agrarian revolution administered from Bucharest had little to recommend it.

Such a situation placed a hard choice before the influential classes in Hungary. While fear of the German influence behind the popular demand for further land reform created very general alarm, the great property owners, whose political influence was in no way lessened, could not bring themselves at once to forestall the danger by putting into effect a set of agrarian laws which would have met the needs of the peasantry. Right up to the autumn of that year, it looked as though this question might wreck the solidarity of Hungary altogether. Early in 1939, Dr. Imrédy's government was defeated by the magnates on the land question, and the circumstances brought about a curious alignment of political parties in Hungary.

On the one hand there was a split in the country on the agrarian issue, which ranged the landless labourers, the dwarf landowners and the other rather dubious elements in the Arrowcross (Nazi) party in Hungary, against the landowners. To them, as far as land reform was concerned, there could be added the Small Farmers party, and the little group of Socialists and Liberals, although all of these were otherwise hostile to the Nazi group. The agrarian question was further confused by the fact that the German Government were paying the Magyar landowners good prices for their exportable surplus. The Third Reich could also point out to those inclined to Nazi-ism in Hungary that adherence to Germany meant not only the promise of redress for the landless but also a further extension of Hungary's frontiers in the north and north-east, so greatly desired throughout the country. The political (and financial) strength of German influence was shown in the early summer of 1939 when the Arrowcross party gained forty-three seats at the General Election.

On the other hand, there were two further problems of extreme interest in Hungary, one of which was the question of the anti-Semitic laws. The history of the Jews in Hungary has been, on the whole, less miserable than that in many other states, as can be judged from their steady immigration into the

[1] See *The Economist*, 21 January 1939. See also Macartney "Hungary and the present crisis," *International Affairs*, vol. 17, 1938.

Old Kingdom in the eighteenth and nineteenth centuries. But after the short ascendancy of Bela Kun, himself a Jew, their position deteriorated and it worsened again, as in many European countries east of Germany, with the economic depression of 1930–34. This second deterioration may be ascribed to German infection, and the situation in 1939 was an indication of the strength of German influence.

Finally there was the whole problem of the extent to which German control could be tolerated in the domestic affairs of Hungary. It would have been difficult for any government in Hungary, for economic reasons if for no others, to evade acquiescence to the Third Reich in foreign policy. But there remained a considerable part of the Magyar population which was, and is, anxious to set limits to German interference in home affairs.

In the crisis of 1939 the third problem eventually took precedence of the other two and brought about a different political division from that previously described for the agrarian issue. Landowners, small farmers, Liberals, Socialists, and a great part of the army felt deeply on the subject of an unchecked manipulation by the Germans of Magyar domestic concerns, and the unanimity achieved on this principle enabled Count Teleki to bring about some positive results in agrarian reform. The third land law of the Regency was passed at the end of 1939, providing for the annual average distribution of 100,000 acres of land for fifteen years.[1] These measures, even if their scope is far from convincing, contributed a little to the decline in Arrowcross agitation among the peasants in 1940. One must recognize however that there were many reasons for the stiffening of resistance to German interference, which have nothing to do with Agrarian Reform.

It is difficult to write at this stage of the future of the Magyar farmer. The economic system of Hungary is, as we have seen, closely tied to that of Germany, and the ebb and flow of the fortunes of the Third Reich cannot but affect the Magyars also. But whether the years to come mean prosperity or the reverse for the farmers in Hungary, it appears unlikely that agrarian reform can stop at the limits laid down by the third series of land laws. Further change seems probable, whatever its economic wisdom or unwisdom, on account of the publicity now attached to the question of the redistribution of land. Moreover, the more educated section of the Magyar peasants, as well as professional economists, can point to the peculiar suitability for western Hungary at any rate, of such a remedy for social and economic dissatisfaction. The ratio of the existing farming population to fertile farming land, the slow increase of the birth rate, and the reasonably efficient standards of farming, all suggest that a further division of property might produce greater political and economic stability. One may hope however that the Magyar group with its great tradition of farming will now and in the future avoid any arbitrary legislation as to the "average" farm, and that Magyar governments will make allowances for the wide geographic variations and for the contrasts in tradition which prevail within the Middle Danube Basin.

[1] See *The Economist*, 21 October 1939.

DISCUSSION

Before the paper the PRESIDENT (Field-Marshal Sir PHILIP CHETWODE) said: The reader of the paper this afternoon, Miss Harriet Wanklyn, is a member of the staff of the Department of Geography in the University of Cambridge, who has in the last few years made a special study of south-eastern Europe. We remember the excellent lecture she gave to our Society in January of this year upon "Geographical aspects of Jewish settlement east of Germany." We look forward to hearing this afternoon her treatment of a part of the complicated problems of Hungary.

Miss Wanklyn then read the paper printed above.

Admiral Sir WILLIAM GOODENOUGH: The President has been called away and has asked me to tender his apologies. Miss Wanklyn hoped that her paper would provoke comment, but with fog impending I do not propose to call upon anybody to open a discussion, much as I would like to do so. Nevertheless the speaker has stimulated our interest in what is a most important geographical and political situation. At the end of her paper Miss Wanklyn referred to the design of future reforms. It is of course difficult at this moment to forecast the form they may take; but that does not mean that we should not study the state of affairs in the hope that when they resume their proper proportion something will be done to clear up the situation between races and languages, and to promote all that goes to make for the happiness of the world.

In the name of the President of the Society as well as of those present I offer you, Miss Wanklyn, our sincere thanks for what is, without exaggeration, a very thoughtful and useful paper.

STRUCTURE AND GLACIERS OF SOUTHERN ELLESMERE ISLAND

ROBERT BENTHAM

DURING two seasons' work in southern Ellesmere Island, between September 1936 and August 1938, I was able, through the courtesy of the Royal Canadian Mounted Police, to use as a base the Post at Craig Harbour in the extreme south-east of the island. From Craig Harbour journeys were made to Makinson Inlet (three times), Coburg Island, North Devon Island, and along the south coast of Ellesmere Island as far as Sydhap Fjord. The longest journey was made in the spring of 1938 when the southern part of the island was traversed, the route being *via* Makinson Inlet, Vendom, Baumann and Eids fjords, Nordstrand, Goose Fjord, and so along the north side of Jones Sound to Craig Harbour.

Of this country, much had been neither surveyed nor examined by a trained observer, while the remainder, although comparatively well mapped, had been examined only in the vicinities of Harbour and Goose Fjords. Thus the map of the south-east coast between Starnes Fjords and Makinson Inlet was based partly on sketches made by various members of the Royal Canadian Mounted Police and partly on the work of Captain E. A. Inglefield in 1852; the only scientific work in the area was the geology done by Per Schei[1] of the Second Norwegian Polar Expedition in the *Fram*, 1898–1902. For the rest our knowledge of its structure and appearance was entirely due to the same expedition.[2]

Except in such places as the passes between Makinson Inlet and Vendom Fjord, Baumann and Eids Fjords, Nordstrand and Goose Fjord, and inland from Starnes Fjord, I made few journeys far from the coast, and travelled on glaciers for short distances only, as at Clarence Head (March and April 1938), where rough ice and open water made a detour necessary. So this paper will deal mainly with the coastal regions.

Ellesmere Island is cut by fjords from the east and west coasts into four natural divisions. In the north Grant and Grinnell Lands are separated by Archer and Greely Fjords; Grinnell Land from the country to the south by Bay Fjord and the fjords extending from Buchanan Bay. The name Ellesmere Land was confined to this southern part of Ellesmere Island, which is subdivided by the close approach of Baumann Fjord in the west to Makinson Inlet in the east. For this southern part the name Sverdrup Land is suggested, in honour of the leader of the Second Norwegian Polar Expedition in the *Fram*, Captain Otto Sverdrup.

Physiography of Sverdrup Land

So far as is known, Archaean rocks are confined to eastern Ellesmere Island, and in Sverdrup Land none have been seen west of Harbour Fjord (except

[1] "Preliminary report of the geological work of the Second Norwegian Polar Expedition," *Geogr. J.*, vol. 22.

[2] 'New land,' by Otto Sverdrup. London, 1904.

for a small faulted block at South Cape) and another at Swinnerton Peninsula.[1] The boundary of the Archaean in the interior is not shown; in the south it lies about 5 miles from the mouths of Starnes, Grise, and Harbour Fjords and when last seen near Starnes Fjord was running north-easterly. East of this boundary however the country is not entirely Archaean since in places, particularly along the south coast, small thin outliers of Cambrian [2] sediments cap the cliffs, while between Starnes Fjord and Craig Harbour blocks of Ordovician limestone have been faulted down into the granite.

West and north of the boundary the country is built of sedimentary rocks, which in the south are mainly flat-lying or have a slight north-westerly dip. Cambrian sediments (including Koch's Thule Beds) seem confined to the vicinity of Fram, Grise, and Harbour Fjords; the rest of the south coast, with the inner reaches of Makinson Inlet, is Ordovician limestone, shales, and dolomite. Silurian limestones occur in the more northerly parts of the south coast fjords and round Vendom Fjord, while Schei has proved the presence of Devonian north of Goose Fjord and Carboniferous on Bjorne Peninsula. Tertiary clays, sands, and lignite beds are found along the south coast of Baumann Fjord.

Faulting is common in Sverdrup Land, though it is easily observed only in the sedimentary area. Between Craig Harbour and Starnes Fjord many of the faults bring light-coloured sediments into lateral contact with dark granite, which make them easy to follow. In this region faulting has two directions, north-easterly and north-westerly. Of the former are the two faults east of Starnes Fjord which let down a block of Ordovician limestone into the granite. The north-westerly are more common, a number cross Starnes Fjord, others occur east of Fram Fjord. Each of these (with the exception of the more northerly Starnes Fjord examples) brings early Palaeozoic sediments into contact with the Archaean.

Although faults farther east were not proved, there are lines of weakness, either faults or joint planes, since the Smith-Cone and Stewart groups of islands are of the block type. I suggest that these lines are faults, but the islands are not so far from land that they cannot be merely joint planes. Isolated flat-topped hills, between the cliffs (or scarp) and the sea, appear at first sight to be islands, but on closer approach are found connected to the mainland by low raised beaches. It is probable that these hills have been separated from the main plateau by denudation along a fault or a joint plane.

A north–south line of weakness appears to be developed in the west. In the east this is not apparent and the general trend of the coast corresponds very closely with the directions of known faulting in the south. Starnes Fjord has been influenced by the north-westerly line of weakness, while Fram Fjord and

[1] This name is suggested for the peninsula separating the north-west and south-west arms of Makinson Inlet, in honour of Professor H. H. Swinnerton, who was the writer's tutor at University College, Nottingham.

[2] The equivalent of Koch's Thule Beds are undoubtedly present in south-eastern Ellesmere Island, being represented by thin beds of conglomerate and sandstone and by dolomite. Koch originally believed that they were of Pre-Cambrian age, but since no unconformity was detected either at Bache Peninsula or in Sverdrup Land they will be treated here as basement Cambrian beds.

the whole of the coast between King Edward VII Peninsula and Clarence Head runs fairly consistently north-easterly. Makinson Inlet shows better than any other fjord the two lines of weakness: its eastern portion zigzags south-westerly and north-westerly, and in the west it splits into two arms, one in each direction.

No conclusive evidence of age was found, but it is presumed that the north-westerly faulting is at least post-Miocene, since in Stenkul Fjord coal measures of that age are separated from strata probably referable to the Palaeozoic (no fossils were found) by a fault in this direction. Dr. Noel Humphreys, the leader of the Oxford University Ellesmere Land Expedition 1934–5, when travelling in Bay Fjord observed steeply dipping coal seams. Although all other coal seams known in Ellesmere Island are of Tertiary age, those in Bay Fjord may be earlier, since Jurassic and Cretaceous coals are known from other parts of the Arctic. No fossils have been brought back from the coal measures of Bay Fjord.

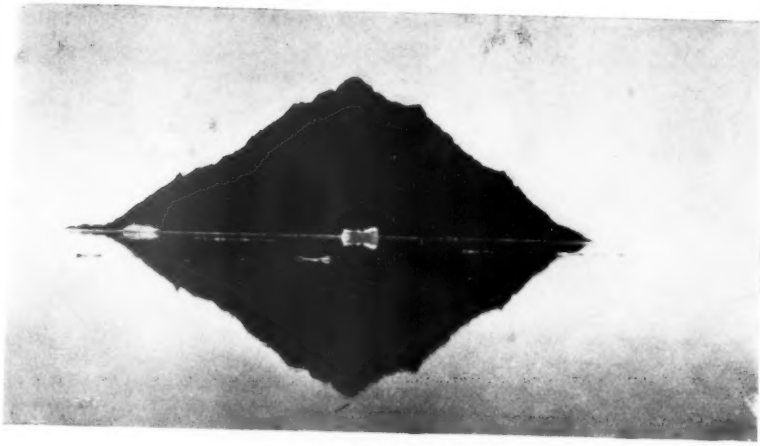
The north-westerly direction of faulting finds its counterpart in Greenland in the Cape York district, where Lauge Koch has found faults of this trend and has postulated the existence of others to account for the present form of the coast-line. Koch [1] suggested in 1929 that in southern Ellesmere Island would be found a fault zone which he correlated with that in the Cape York district. He is of the opinion that the age of the faulting is probably Cretaceous, but the observations in Ellesmere Island put it later than this and possibly relate it with the Tertiary faulting of Disko Island.

In his description of North Greenland Koch gives an account of a belt of folding which he suggests is of Caledonian age and is continued in Grinnell Land. Folded strata have been reported by Feilden [2] in Kennedy Channel and disturbed beds of Ordovician age were observed by me near Scoresby Bay in 1935. Similar flexures occur in the area round Vendom Fjord, being particularly well developed at its head, where folding on a north-east to south-west axis has given rise to a series of sharp anticlines now well exposed by the erosive action of streams, and to a mountainous region in the north-west and west. Towards the south the flexures become less acute, though in many places, as along the north coast of Baumann Fjord, the strata have a very steep dip. Similarly towards the east the folding becomes less severe and practically disappears about 11 miles from the head of Makinson Inlet. Little is known of the extent of the folding in other directions. It is not seen on the south side of Baumann Fjord where it is either buried under newer strata or swings out to sea. To the east and north data are lacking, but it is tempting to assume that this belt of folding is a continuation of that running across Grinnell Land, Kennedy Channel, Hall Land, and Peary Land.

With regard to the age of the folding evidence is not plentiful, but it is definitely post-Silurian, since corals of that age were found in the folded strata at the head of Vendom Fjord. Moreover it is unlikely that the folding terminates abruptly at Baumann Fjord; it probably crosses to the south side

[1] "Stratigraphy of Greenland," *Medd. om Gron.*, vol. 72, No. 2, 1929.

[2] Feilden, H. W., and C. E. de Rance, "Geology of the Coasts of the Arctic Lands visited by the late British Expedition under Captain Sir George Nares," *Geol. Journ.*, vol. 34, 1878.



Cone Island

Craig Harbour

Starnes Fjord valley

South point of Smith Island

Piedmont glacier, Smith Bay

Snowdrift ice near Craig Harbour

under the neck of land connecting Bjorne Peninsula to the mainland. Rocks in this region have yielded me fossils of Devonian age, and of Devonian and Carboniferous ages to Schei. Since these strata are comparatively undisturbed it is probable that the folding is pre-Devonian. This evidence is not however conclusive since it is possible that the folding does not cross Baumann Fjord. As far as the evidence from other areas is concerned, Schei maintains that the folding took place some time between Triassic and Miocene times, since along Eureka Sound he found that rocks of Triassic age had been thrown into folds, while wherever Tertiary was seen it was horizontally bedded. Schei also suggested that his Triassic beds could be correlated with part of the Cape Rawson Beds of Feilden, but Koch is of the opinion that this correlation is incorrect. As far as Kennedy Channel is concerned, both Koch and Feilden agree that the Cape Rawson Beds occur on both sides of the channel and the former author has found in them fossils, which are of doubtful Silurian age. Koch is also of the opinion that the age of the folding in this area (Kennedy Channel) is of Caledonian age, though his reasons for this suggestion are not conclusive. Feilden reports that at Feilden Peninsula, in northern Grant Land, the axis of folding in the Cape Rawson Beds disappears beneath Carboniferous strata, which would seem to indicate that the folding took place some time between the end of Silurian and the beginning of Carboniferous times. But none of this evidence is conclusive, since the fossils found by Koch cannot be ascribed definitely to the Silurian, while Feilden could not determine whether the junction of the Carboniferous with the Cape Rawson Beds at Feilden Peninsula is an unconformity or a thrust plane.

Coastal topography of the Archaean area.—The Archaean area is very heavily glaciated, the limits of the ice coinciding approximately with those of the igneous rock. This cover of ice is heaviest near the east coast, particularly in the neighbourhood of Smith Bay, so that the coastal topography of the area is mostly dominated by ice.

Between King Edward VII Point and Clarence Head the coast runs northeasterly with no prominent headlands or large bays, except that west of Cape Norton Shaw. Large glaciers project into the sea and fill what would be bays. Except for small remnants of raised beaches, the coast has steep cliffs from 800 to 1700 feet, sometimes dropping sheer into the sea, but more often scarred with gullies with extensive screes. Another feature is the isolated, flat-topped hill, of which the best is opposite the Stewart Islands. Here a roughly rectangular hill, which was formerly an island, rises to about 800 feet above sea and stands between the sea and the scarp behind. Outside it is another granitic outcrop, reduced by marine erosion to a rounded knoll no more than 200 feet high. These two masses are connected to each other and to the mainland by raised beaches. A few miles out to sea are the Stewart Islands, probably of similar origin. The larger of the Stewart Islands is comparable with Smith Island in general shape, with steep cliffs rising to a plateau about 1500 feet high; the smaller is almost identical with Cone Island, both conical. This tendency towards a cone is common in southeastern Ellesmere Island, small pointed pinnacles standing out from the cliff face. Two sets of joint planes tend to make roof-shaped features, which weather to a roughly conical form.

Clarence Head, projecting into Baffin Bay, catches the full force of the current from the north. So the sea-ice round it and along the coast to the north is either thin or absent, and one must travel on the glaciers which form the greater part of the coast-line. I did so in March and April 1938 and found a hot spring flowing into the sea beside one of the glaciers. Natives say there are others of these springs along the east coast of southern Ellesmere Island. Small lenticles of sulphur occur in the limestones of Swinnerton Peninsula in Makinson Inlet.

From Clarence Head the coast runs north-westerly for about 13 miles, turns south-west for 14, and north-west again for 30 miles to form Smith Bay. This part of the coast has more glaciers, while what land can be seen is serrated ridges and nunataks. On the eastern and south-eastern sides of the bay magnificent ice- and frost-shattered peaks, rising to 2500 and 3000 feet, bear numerous cwms from which small glaciers flow to coalesce with the main glacial fringe.

Near the mouth of Mackinson Inlet the scenery is alpine; to the west it reverts to the cliff and plateau type, probably like that seen by the Wordie Expedition of 1937, in north-east Baffin Island. There, while nothing but jagged peaks could be seen from the sea, they found, on climbing these mountains, that the interior was but slightly dissected plateau.

The cliffs round the greater part of the bay north of Craig Harbour are separated from the sea by raised beaches or glacial outwash. Here the ice begins to recede from the coast and one can examine the topography developed in the more or less ice-free regions. Inland the country is plateau interrupted by small hills, rising about 200 feet above their surroundings, while nearer the edge of the ice-cap a series of levels between 1720 and 2080 feet is developed. These are frost-shattered material of local origin and have a slight slope to the south, in which direction they gradually disappear. They may be associated with stages in the retreat of the ice-cap.

The surface of the other plateaux is frost-shattered material, usually small. In places, as above Starnes Point, there are large sub-angular boulders which cannot be ascribed to frost shattering and can only have been brought into their present position by ice, which even now is only 3 miles away.

The Archaean area has been so heavily glaciated that rivers are small and unimportant. Of the very small streams, most have originated in the plateau regions into which they have cut back for a distance up to 2 miles. They have typical youthful valleys with steep gradients and V-sections. In their upper reaches however they differ from streams in more temperate regions; their sources are in snow or ice drifted against the walls of a bowl-shaped depression whose floor has a comparatively low gradient. The peculiar form of the valley head is probably due to thaw water running between the ice and the rock, alternately freezing and thawing, and thus breaking down and removing material from round the walls of the bowl. Thus the head of the stream is constantly working inland and apparently this process is more rapid than the downward erosion of the stream since the higher part of the valley has a much gentler gradient than the lower.

The stream which flows into the head of Fram Fjord occupies a valley from 1 to $1\frac{1}{2}$ miles wide and has its source in a glacier about 8 miles from the sea.

The stream is very small; the valley is an extension of the fjord, and probably moulded by glacier action since it has a well-marked U-shape; and there is a rounded knoll, evidently a roche moutonné, about 5 miles below the glacier. There are no old moraines between the sea and the present terminal moraine.

The stream though small does much erosive work during its flood period in July. Like most of the glacial outwash streams of Ellesmere Island, it is braided, owing to the low gradient of the valley and the excessive load it carries.

Physiography of the sedimentary area.—The area of Sverdrup Land, which is built of sedimentary rocks, is larger than the Archean. It extends westwards from Starnes Fjord and Harbour Fjord as far as Norwegian Bay and northwards to include the south coast of Baumann Fjord and the inner reaches of Makinson Inlet. In some areas faults and steeply dipping strata do occur, but generally the beds are horizontal or have a very low dip.

The coastal scenery belongs to two types, corresponding to the distribution of the thick hard limestones and dolomites of Ordovician and Silurian ages, and the less massive limestones of later ages. The former rocks outcrop all along the south coast as far north as the central part of Goose Fjord. In this area are numerous fjords running north and south and bordered throughout by high mural cliffs with scree-covered bases. Between the fjords, the coast is of similar type and tends to run easterly.

Along the shores of Norwegian Bay, north of Goose Fjord, the country is very different, the coast line little indented; while the land rises from sea-level to the interior with very gentle gradient. This part of Sverdrup Land was traversed in early May 1938, when the ground was still snow-covered. So gentle was the gradient that in places it was impossible to determine where the ice-foot terminated and the land began. North of Oksebaasen the south coast type recurs, though the fjords are small and run easterly or south-easterly. On Bjorne Peninsula the gentle type reappears, and this headland, like the south coast of Baumann Fjord, as far as Sor Fjord, is low rolling country of no great height (800 feet in the case of Bjorne Head): the coast-line little indented. On the return from Vendom Fjord to the south coast, I crossed the neck joining Bjorne Peninsula to the mainland, and after travelling about 10 miles up a valley bordered by gently rounded slopes, reached the watershed at no more than 410 feet above sea.

Soft beds of sand, clay, and lignite outcrop along the south side of Stenkul Fjord and make the country different from any other in southern Ellesmere Island. Low cliffs of from 50 to 500 feet rise from the shore, but unlike the scarps of the south coast, are largely of downwash, with low steep outcrops of solid rock here and there. These slopes have been cut into small V-shaped gorges by summer floods.

I visited Starnes Fjord in March 1937 and in June 1937 and 1938, so that this area, typical of the south coast of Sverdrup Land, is more familiar to me. The country is essentially in blocks formed by streams at right angles to the fjord, fed by tributaries parallel to the coast. The summits of the hills are mainly dip slopes (in this area trending north-north-west) terminating in the usual scarp with its scree-covered base.

The stream which enters the head of the fjord occupies a steep-walled valley about $1\frac{1}{2}$ miles wide at the mouth. As in Fram Fjord, the stream is comparatively small. The valley is zigzag, alternately in dip and strike directions. The stream flows for much of its lower course braided in a wide valley, but about 7 miles from the sea it begins a series of sharp bends. Contrary to the general rule, the strike reaches of the valley are invariably much narrower than those following the dip, and in some cases are reduced to gorges only a few yards wide. These sections are invariably much shorter than those following the dip, and presumably occupy enlarged joint planes.

The stream flowing into the head of Starnes Fjord was not followed to its source, but one in Makinson Inlet was, during the journey from the inlet to Vendom Fjord. In the upper reaches of the Makinson stream the sides of the valley become more rounded as the gradient increases from about 1/100 to 1/45 and tributaries on either bank become more common. Finally there is a short, sharp rise to the plateau country, where it is no longer possible to follow the main stream among the innumerable small rivulets. The watershed between Makinson Inlet and Vendom Fjord lies at about 1100 feet, but hills of about 1600 feet were seen rising above the general level of the plateau. Visibility was poor, and it was impossible to see much from the highest point reached.

Physiography of the folded area—Vendom Fjord

The belt of folding which crosses western Ellesmere Island about Vendom Fjord is not, strictly speaking, in Sverdrup Land, but may be described here. The country is completely free from ice, though an ice-cap can be seen in the extreme north-east of the fjord, and the simple plateau and scarp topography, so common in the sedimentary area, is poorly developed. Instead there are complex rounded hills cut by numerous streams, near the fjord, and inland many irregular peaks. The north side of the fjord is overshadowed by five mountains averaging about 1500 feet, their south-eastern faces gently rounded dip slopes, their north-eastern and south-western faces scarps. Between them are broad passes at about 1000 feet, and nearer the sea is a rounded hill of 500 feet, scarred by narrow but deep gorges.

North and west of the fjord there are mountains, reaching to 3000 feet, cut by streams and separated by wide valleys. Southward the country is lower and rounded on the west side of the fjord, rising gently to between 500 and 700 feet up to 10 miles inland, their peaks like those farther north. At the head of the fjord, on the east, there are angular peaks like, but not so high as, those in the west. Hard, steeply dipping limestones form the cliffs and plateau which border the north-east side of Stenkuls Fjord and the mouth of Vendom Fjord.

Raised beaches

The most extensive are on the south coast between Craig Harbour and Grise Fjord where they form the greater part of the shore-line, the old cliffs now being up to 2 miles from the coast. They are also well developed in the south-west arm of Makinson Inlet and in Vendom Fjord. Along the south-east coast between King Edward VII Point and Makinson Inlet the only extensive beach is on the mainland opposite the Stewart Islands, but there are small ones at the heads of inlets near Clarence Head and Cape Norton Shaw.

Many heights were measured but there was little agreement in the altitudes; the surface of a raised beach is curved and differences in level may be caused by erosion. Certain heights are widespread; a beach at about 60 feet occurs in Starnes Fjord (62 feet), opposite the Stewart Islands (62 feet), and in Makinson Inlet (58 feet), and others at about 180 feet in Starnes Fjord (176 feet) and in Makinson Inlet (184 feet).

Benches cut in the solid rock by streams or marine action may be seen at the point where the most northerly of the tributary streams at Craig Harbour joins the main valley. The spur flanking the stream has two well-marked benches at 334 and 458 feet and a third, less obvious, at 530 feet. The two lower benches, difference 124 feet, probably correspond to the 60 and 180 feet beaches. Most of the capes in the Archaean area have, at their extremities, marine-cut benches at about 60 feet, particularly well developed on King Edward VII Point and Smith Island. At the mouth of Grise Fjord the form of the cliffs suggests glacial erosion, but the absence of glacial scoring on the bench and its correspondence in height with the 60-foot terrace indicate marine action.

Glaciology of Sverdrup Land

Sverdrup Land supports at least four areas of ice which may be classified as Highland Ice, since they are small and not thick enough to conceal the underlying topography. The largest is in the Archaean east; a small one lies between Grise Fjord and Starnes Fjord; a fairly large one feeds the glaciers flowing into Sydkap Fjord; and a fourth is between Goose and Musk-Ox Fjords.

The ice-cap on the south-east of Sverdrup Land (North Lincoln) approaches very closely to the east coast, but retreats inland along the south coast and Makinson Inlet. This roughly coincides with the disappearance of the Archaean from the cliff section, and it is probable that the limits of the inland ice and the Archaean rocks are similar, between the mouth of Starnes Fjord and the central portion of Makinson Inlet. This diminution of ice towards the west is characteristic of the whole of southern Ellesmere Island, for the ice-cap recedes also from the north coast of Makinson Inlet and is not seen again until the head of Vendom Fjord is reached. From the latter it probably runs north-north-westerly towards the head of Bay Fjord. In parts of Greenland and the Antarctic, in similar conditions of height and supply, the igneous or metamorphic rocks are ice-capped while the sedimentary areas are not. In Ellesmere Island contributory factors are the proximity of the east to the open water of Baffin Bay, and the greater height of the land in the east. In the east, heights of over 5000 feet have been recorded by the Sverdrup Expedition and over 6000 feet by Wright and Hamilton in 1938, while in the west no peaks above 3000 feet were seen.

In south-eastern Ellesmere Island three main glaciers originate in the highland ice: normal valley glaciers, expanded-foot, and piedmont glaciers. Cwm and snow-drift ice are present, but island ice, confluent ice, floating ice-tongues, and wall-sided glaciers, common in the Antarctic, were not seen.

Normal valley glaciers are poorly developed in the coastal regions of the south-east; but there are many which may be called "cascading": usually small, and confined to areas where the highland ice reaches the top of the

cliffs and overflows. They vary in size from a small lobe in a gully at the summit of the cliff, to a heavily crevassed glacier a quarter of a mile wide. Larger valley glaciers are mainly confined to the west, where the retraction of the highland ice away from the coast allows them space. Some differ from the glaciers of more temperate regions in being fed by cascading glaciers.

Expanded-foot glaciers are the predominant type in Sverdrup Land: the glacier east of Fram Fjord, Wilcox, Cory, and Finney glaciers, wherever a regularly shelving sea-bottom favours their development. There are a few small ones in Makinson Inlet.

Wilcox Glacier is about 3 miles long, descends with a steep gradient through a narrow valley, but on approaching sea-level flows out on either side. Wilcox Glacier is crevassed only where the gradient is steep, though the expanded foot portion is very hummocky. It can be seen from above that the hummocks are arranged in concentric rings parallel to the snout.

The surface of so short a glacier is free from moraine, as would be expected, and englacial material is not plentiful. Where the snout rests on land there is a terminal moraine, of irregularly sorted material, with very little sign of glacial scoring; a ridge about 30 feet high round the snout of the glacier, and in the Wilcox Glacier up to 50 yards from the ice.

A small ice-foot along the tidal portions of the snout indicates that the glaciers are not afloat and the absence of pressure ridges in the sea-ice at the foot, and with the terminal moraines some distance from the snout, shows that the expanded foot glaciers are not advancing. At the end of March a large crack was seen in the face of the glacier west of the Stewart Islands, and in early April a large piece had broken off, smashing the sea-ice.

Piedmont glaciers are best developed round Smith Bay, where practically the whole coast is ice. Small glaciers from cwms in the mountains and glaciers from the highland ice coalesce to form masses of moderate gradient to the sea, with cliffs about 20 feet high. Surface and englacial moraines are lacking, and they are not afloat.

Snow-drift ice is common in the windswept country of the south-east and well developed round Craig Harbour. False moraines are formed by material from rock exposures on either side sliding down to the bottom. In a few cases the snow-drift ice clinging to the cliffs shows movement by bergschrund lines near the summit. Snow-drift ice in the bed of a stream tends to be protective, particularly if over unconsolidated material.

Cwm glaciers are principally developed around Smith Bay, where more ice accumulates than elsewhere, probably not so much by excessive precipitation as by absence of ablation, the mountains protecting the snow from the winds blowing off the ice-cap. Travelling in Smith Bay is always difficult owing to deep soft snow.

No evidence pointed to a complete glaciation of Ellesmere Island in past times. No trace of the former glaciers in the valleys between Makinson Inlet and Vendom Fjord was seen and no erratics were found more than 5 miles from the ice-cap. Most glaciers in south-eastern Ellesmere Island appear stationary, or retreating a little. Between 1936–38 the larger of the two glaciers at Craig Harbour retreated 6 feet and its snout is less than a quarter of a mile from the oldest moraine.

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APPENDIX: NOTES ON THE SURVEY

The available map of south-eastern Ellesmere Island was based on Captain Sverdrup (the south and west coasts) and Inglefield (the east coast), the Canadian Government Expedition in the C.G.S. *Arctic*, 1923 (Starnes Fjord), and the Royal Canadian Mounted Police (Fram Fjord, Craig Harbour, and Makinson Inlet). The maps of the Sverdrup Expedition seem good; the others although good sketch-maps are inaccurate and lack detail.

I decided to survey the coast between Starnes Fjord and Makinson Inlet by plane-table traverse, controlled by astronomical observations.

Survey began in March 1937 with a short trip to Starnes Fjord, to determine its length. On the return journey I made a plane-table traverse with sledge wheel. Frozen fingers compelled return to Craig Harbour without attempting further survey.

In April dog food was limited to ten days. From Clarence Head the plane-table traverse was run to Swinnerton Peninsula, in Makinson Inlet. A rapid return was made to Clarence Head and the traverse carried back to Cape Norton Shaw, where the fingers frozen in March were too tender to permit further work. Later another journey was made to Cape Norton Shaw and the traverse was completed.

During 1938 the south-west arm of Makinson Inlet was mapped and a compass traverse made overland between the inlet and Vendom Fjord. On this journey a theodolite and wireless receiver were carried to make longitude observations as a check on the work of the Sverdrup Expedition, who used chronometers. Unfortunately, the theodolite was damaged at the head of Makinson Inlet. By June 1938 the coast between Starnes Fjord and Craig Harbour was mapped, latitude had been taken at Fairman Point and Stewart Island, and Cape Spencer on Coburg Island had been fixed by means of a latitude at the cape and azimuths from the plateau east of Craig Harbour.

Degree of accuracy of the survey

Although the general outline from my survey is like the Canadian Government map of 1929, there are differences. I made Starnes Fjord about 6 miles farther east, Fairman Point 4 miles farther west, Swinnerton Peninsula 4 miles farther east and 12 miles farther north; Cape Spencer on Coburg Island about 10 miles south-east of the old position and the island itself about 5 miles shorter.

VENEZUELA IN 1940

A. E. GUNTHER

Meeting of the Society, 16 December 1940

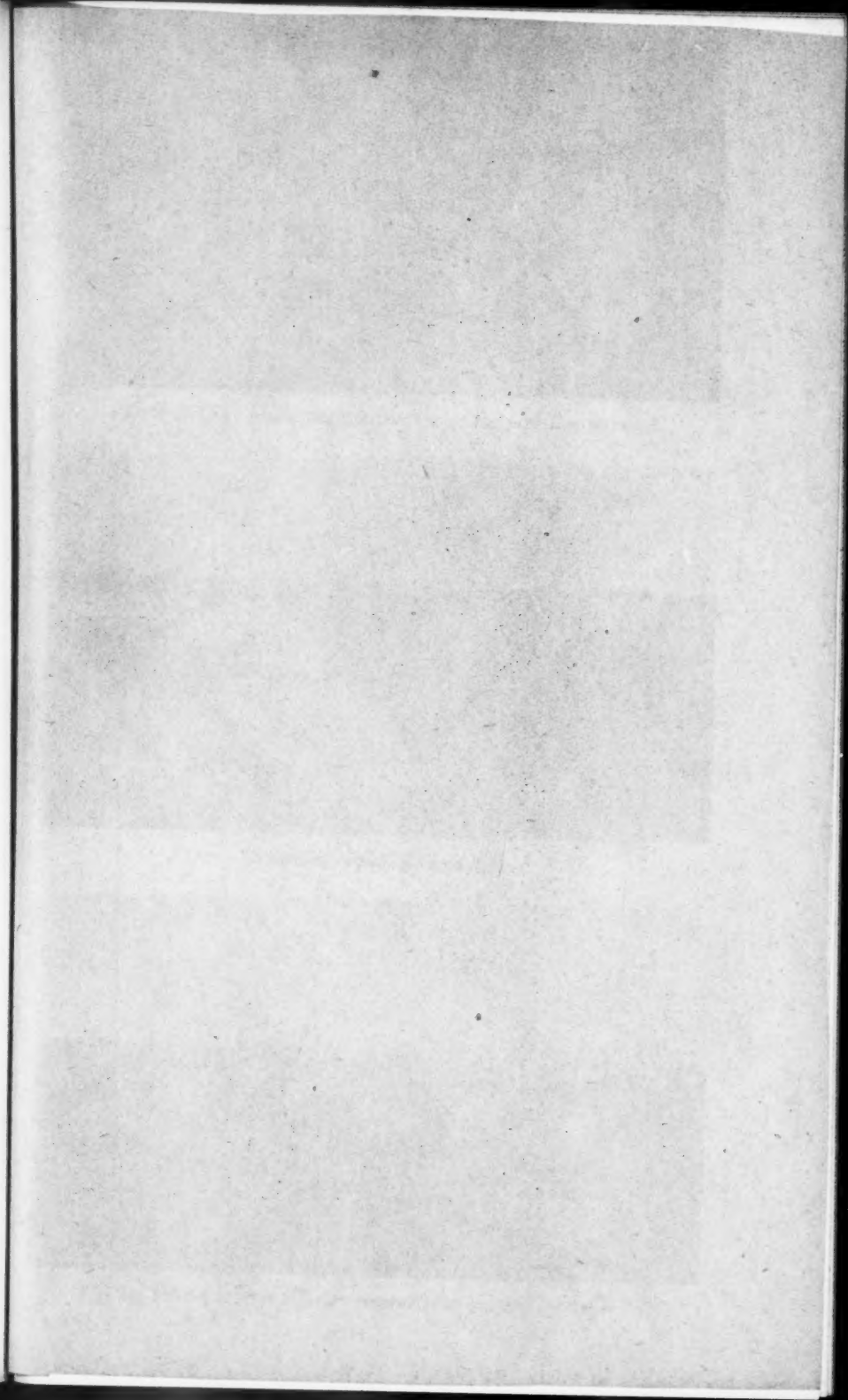
THE Republic of Venezuela, bordering on the Caribbean Sea, has come into special prominence in this century, thanks to the discovery of vast resources of petroleum, a commodity more vital to us in this war even than in the last. The country is of particular interest to us to-day because what one may call its modern development dates from the discovery of oil.

Approaching Venezuela from the sea, whether from the east, as did Columbus, or from the north at Cumana, like Humboldt and Bonpland, or landing from a liner at La Guiara to-day, one is confronted by formidable mountains. These, the Andes and the Maritime Ranges, together divide the country into two regions. To the north of these mountains lie the Caribbean Sea, the desert ranges of Falcon, the desiccated peninsula of Paraguana and the basin of the Lake of Maracaibo. South of this range lie the Llanos with their Mesa plateaux, the great river basins of the Orinoco and the Apure, and rising to the south-east, the Guiana highlands.

The capital of Venezuela, Caracas, centrally situated in the Distrito Federal, is the political, financial, and social centre of the country. But the natural resources which have brought Venezuela to the forefront among South American Republics are derived primarily from the regions of the Lake of Maracaibo, and secondarily from the Llanos plains of Eastern Venezuela, the States of Anzoategui and Monagas.

The Maracaibo Lake Basin includes most of the State of Zulia, economically the most important physiographical province in the country. It occupies a shallow topographical and structural depression formed by the north-east divergence of the Venezuelan Andes from the Eastern Cordillera, lying between the Sierra de Perija to the west, the Sierra del Norte to the south, and the hills of the State of Falcon to the west. Intermittently since Eocene times it has received the sediments from the surrounding hills, and the ancient seas, rich in life, have been the origin of the vast reservoirs of petroleum we are tapping to-day. These seas have always been shallow. To-day, the lake in the centre is about 90 feet deep; 5 miles from shore the depth averages 30 feet. Much of the margin stands at lake level, much is swampy, even tidal, though tides are slight. The flat deltaic regions of the south-western rivers (the Rio Catatumbo and Escalante) come second in size to the Amacuro Delta of the Orinoco, and appear from the air an immense flat of partly forested swamp, lagoon-studded and cut by meandering river channels.

The entrance into the Lake of Maracaibo, cut through the dry, sandy, scrub-country of North Zulia, is shallower even than the lake itself. An uplift outside the entrance, bringing to the surface older rocks which form the Island of Toas, has all but closed it. A submerged bar of shifting sand has left a narrow channel navigable to vessels of 14-foot draught which can pass at high tide. Oil companies working in the Lake of Maracaibo have fleets of



Puerto la Cruz before the construction of the pipe-line terminal

Lagunillas oilfield: inland dyke

La Rosa-Cabimas oilfield: general view overlooking lake

Lagunillas oilfield: dyke protection

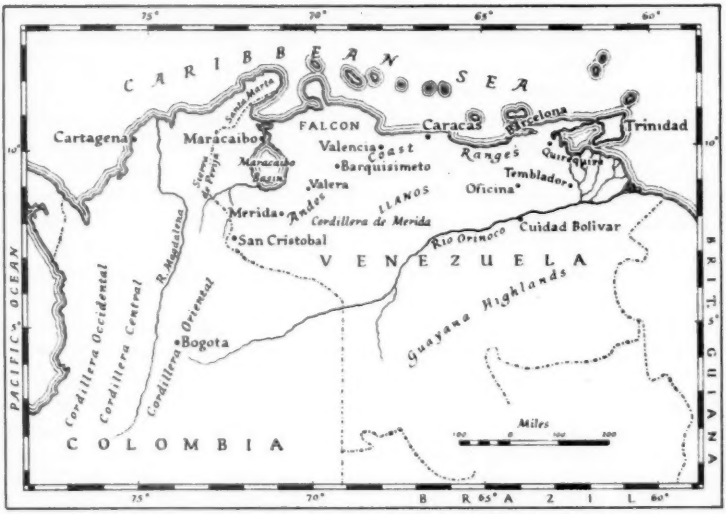
Lagunillas oilfield: protecting dyke

La Rosa oilfield: pier with wells drilled into lake

shallow-draught tankers for the shipment of their crude and locally refined products from the field terminals to other Venezuelan ports, to Curacao, Aruba, and elsewhere.

The second great geographical province of Venezuela is the Llanos, the equivalent of the Argentine Pampas, a broad belt of bush country extending from eastern Venezuela to Colombia. Within the Llanos is included the Mesa plateau. The term Mesa is a local, but sometimes extensive, topographical expression; it describes a broad terraced plateau, the bed of a past inland lake or gulf, a deposit partly fluvatile, partly, may be, marine. The differences between Llanos and Mesa are vegetational, climatic, but at basis geological; Pleistocene plateaux cap Pliocene and older rocks.

In eastern Venezuela the true Mesa plateau lies south of an east–west line



cutting the area in half. The boundary is a cliff escarpment rising 60 feet above the undulating Llanos plain. This plateau is a vast, grass-covered flat, rising to 1000 feet above sea-level at the centre, but averaging 400 feet. It can be as flat as a pancake or may undulate gently, dipping perhaps a half, or one or two degrees, as it does from Oficina south to the Orinoco. In the rainy season hundreds of square miles of country may be flooded or boggy; in the dry a car can be driven for hundreds of miles across the rough gravel and grassy surface.

Previous to 1936, geological surveys had pre-supposed that the superficial deposits in Mesa areas cover everywhere the older rocks, and that there was no geology. But the thickness of the Mesa cover, though locally several hundred feet, and averaging about 100 feet, may also be superficial, and formations outcrop in many river valleys. What was once left on maps as alluvial blank, is now dotted with geological symbols. Though the content of the

Mesa beds and of the underlying formations are of sand and clay in varying proportions, and are scarcely distinguishable to the eye, each carries a distinct vegetational growth upon which geological surveys may be based. The older the formation the richer the vegetation. The weathering of the Mesa deposits running red to crimson, and charged with acids, does not encourage plant life. Consequently the vegetation of the Mesa stands in contrast to that of the Llanos. The surface of the Mesa is covered with a coarse grass, and a sparse distribution of *chaparro* and *alcornoque* trees, miles of Mesa having no trees at all; but where formations come to the surface, Roble and *coroza* trees, palms, cacti, and thorny scrub will grow. The Llanos vegetation is suitable for cattle; the rough, wiry grass of the Mesa is not.

Islands of forest may also occur under certain conditions of underground water supply, or where ranches have left organic matter. Streams cutting through the Mesa terrace like miniature cañon bear dense jungles of vegetation. A line of *moriche* palms marks the courses of valleys; the Orinoco may be traced from the air by its belt, often 2–3 kilometres wide, of *morichales*.

The Llanos as a whole enjoys a long dry season; the Mesa a dryer. Storms drift over the Llanos belt, and leave the Mesa dry. Here geological formation through soil and vegetation contributes to climate; the Mesa plateau is healthy, eastern Venezuela being blessed by the north-east trades; the forested Llanos not always so. It is said that in Colonial times the Llanos supported immense herds of cattle and horses maintained by expert horsemen, the *llaneros*. But these diminished with the unrest following the wars of Independence, as devastating as the Thirty Years' War was to Europe. The result has been to increase the forest of the Llanos plains.

With the Orinoco river region, from the delta of the Amacuro to the Colombian and Brazilian frontiers, recent exploration has been less concerned. Of the four hundred and thirty-six tributaries of the Orinoco and Apure rivers few have been mapped, though in the last three years surveys have covered large areas of the Apure basin. Exploration in this region is difficult except in the dry season, and then it is hampered by low water in the rivers. During the rains (May to November) large parts of this basin are flooded and inaccessible. The Apure river may be 2 or 7 miles in width according to the season. One geological party, caught in the rains, had to jettison its mechanical transport. Much of this region comes within the Llanos belt; much of it, including the swamps of the Amacuro Delta, is covered by tropical rain forest, the setting for Rima in Hudson's 'Green Mansions.' The mining activities in the Guyana Highlands, of iron in the foothills of the Sierra Imataca developed early in the century, or of gold in the Callao region dating from the 1860's, fall outside the bounds of recent exploration.

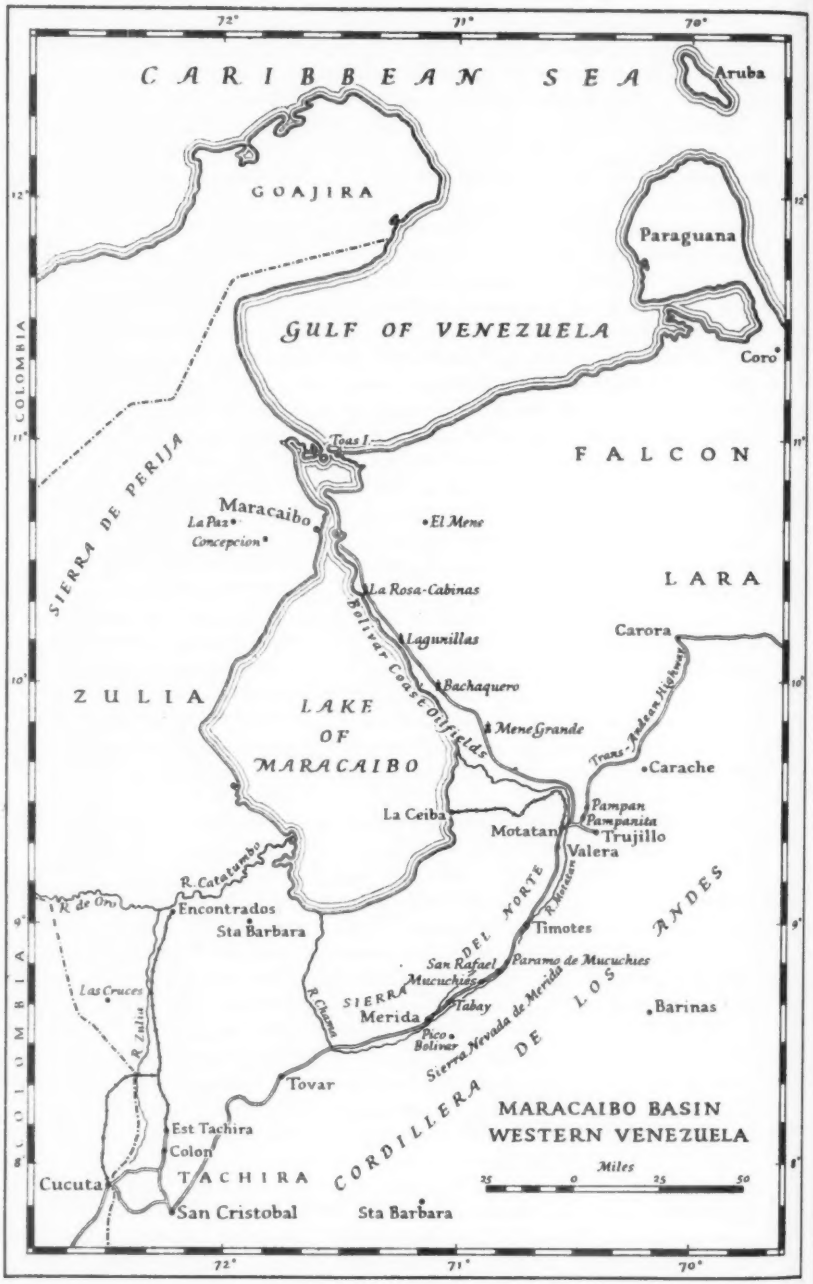
These two provinces, that of the Maracaibo basin, and the Llanos of eastern Venezuela, have together provided the wealth of Venezuela during the last two decades. To appreciate the contribution that the petroleum industry has made not only to the development, but also to the mapping, of Venezuela, a brief review of its growth must be given. With the reports of oil seepages by natives or early prospectors, with the small-scale enterprise in the State of Tachira in '80's, or with the digging of asphalt which promised to rival Trinidad's Pitch Lake, we are not here concerned. The beginnings of the

modern petroleum industry date from 1907 when foreign interests secured large concessions, the usual prelude in countries new to oil. Geological exploration and drilling in those days was spasmodic; the catastrophic break in Mexican production had not then stimulated the industry in South America. There was drilling in the Guanoco Field in the State of Sucre, and an oil well, the first in the country, was completed there in 1913, but no field was developed. Several wells had been drilled near Mene Grande, the Great Seep, to the east of the Lake of Maracaibo on the site of a broad tar flow. Oil was first struck there in 1914. In January 1917 the first shipments were made by barges to the island of Curacao to fulfil an Admiralty contract, a red-letter date in the annals of Venezuela, and shortly thereafter Venezuela's first refinery was started. But the real development of the industry did not start until December 1922, when a spectacular discovery well near the eastern shore of Lake Maracaibo proved the existence of prolific oil reserves and focused the attention of the industry upon the country's potentialities.

After 1923, along the length of the Bolivar coast of the Lake of Maracaibo the growth of this industrial infant prodigy was little less than phenomenal. Within three years two major fields, La Rosa-Cabimas and Lagunillas, to take their place among the world's largest, were in full blast. Development was hectic. Wells were sunk by the hundred on land, and from platforms built over the shallow waters of the lake. Fleets of small tankers steamed between the lines of derricks that marked the shipping lanes, were loaded from pipelines on piers, and waited in their dozens for the flood tide to cross the Maracaibo bar. The result to-day is that the several fields almost join into one —from La Rosa to Bachequero, a forest of derricks stretching for 50 miles, for 5 miles deep inland, and 8 miles out into the lake; an industrialized region which has few parallels in the world to-day. Nor, even in the Maracaibo basin, did this end it. The post-war decade saw lesser fields developed at Concepcion and La Paz, west of Maracaibo; El Mene, to the east; and Colon in south-west Zulia.

For the first twenty years of its development the oil industry centred upon Maracaibo. Geological exploration had started as early in eastern Venezuela as it had in the west, but the conditions of production and transport in the Bolivar coast fields were not easily challenged. When the boom had subsided development might have started elsewhere, but the economic crisis of the early '30's came on and damped large-scale exploration. It had long been known that eastern Venezuela was a rich area also, and in the immediate post-war years drilling had been undertaken with little success. The country was not difficult of approach; it has water on three sides; but the interior was undeveloped. There were no motor roads. Dry-weather roads, scarcely motorable during the rains, linked the towns on the Caribbean with the few inland villages, with Cuidad Bolivar and with the settlements on the Orinoco.

In 1924 Quirequire, 30 kilometres north of Maturin, was the first field to be opened up in this area, shipment of oil being made through a terminal at Caripito, on the San Juan river. The field of Pedernales on the Gulf of Paria was started in 1934; Temblador (the "electric eel"), west of Uracoa, in 1937. But the rival to the Maracaibo basin is at Oficina, in Central Anzoategui, high up on the Mesa plain. Two years of intense construction has now brought oil


CARIBBEAN SEA
Aruba
GOAJIRA
Paraguana
GULF OF VENEZUELA
Coro
COLOMBIA
Toas I.
FALCON
SIERRA DE PERIJA
Maracaibo
La Paz
Concepcion
El Mene
LARA
La Rosa-Cabinas
Bolivar Coast Oilfields
Lagunillas
Carora
ZULIA
Bachaquero
LAKE OF MARACAIBO
Mene Grande
Trans-Andean Highway
Carache
La Ceiba
Pampan
Pampanita
Motatan
Trujillo
Valera
R. Catatumbo
R. de Oro
Encontrados
Sta Barbara
R. Motatan
Timotes
DEL NORTE
ANDES
San Rafael
Mucuchies
Paramo de Mucuchies
Las Cruces
SIERRA
Merida
Tabay
Barinas
R. Chama
R. Zulia
Pico Bolivar
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9°
8°

to the Caribbean seaboard. A terminal for ocean tankers has been constructed at Puerto la Cruz near Barcelona; a road and pipe-line 100 miles in length have crossed the Serrania del Interior and run due south across Llanos plains and Mesa plateau. Oficina is now an operational centre with quarters for one thousand men. An industry on an east Texas scale has settled on an open, grassy plain.

Not the least of the contributions which this great industry has made has lain in exploration and mapping. It may not be going too far to say that modern cartography in Venezuela dates from the last twenty years. The Spanish administrative divisions which determined the outlines of many of the South American republics, have proved inadequate for frontier demarcation. In 1830, twenty years after the proclamation of Venezuelan independence, the Congress of Venezuela authorized the making of a general map of the republic. The work was entrusted to G. B. A. Codazzi, who spent ten years upon the survey. He is said to have fixed over one thousand positions and over one thousand heights by barometer. His 'Mapa fisico y politico de la Republica de Venezuela' was published at Caracas in 1840, and it has been the basis of almost every subsequent map up to the last decade or two. But this survey, great as was its contribution to geographical science, left much undecided. The boundaries between South American republics are a rich field for dispute. The frontier question between Venezuela and Colombia, for instance, simmered for eighty-five years, and the boundaries between the Venezuelan states are not everywhere certain to-day. The law of 1856 is still the authority for frontiers between States, though their legislatures are empowered to fix boundaries between themselves by mutual consent. During the last twenty years, and especially during the last ten, the surveys resulting from economic development have contributed much towards the settlement of these questions by the provision of accurate topographical maps, and it is fortunate that the industry principally involved has been one in which surveying plays an essential part. Industry naturally hesitates to plant itself in a land where boundaries carry the threat of legal action.

That the petroleum industry in Venezuela has played a many-sided part in the survey and in the opening up of the country will be evident when a few aspects of its activity are considered. First with regard to mapping. The Mining Law of the Government decrees that a petition for a licence for geological exploration must be accompanied by a rough sketch-map (croquis) of the area. An exploration licence is granted for a term of three years, and at the end of that time a survey must be submitted to the government, first of the whole concession (showing principal rivers, landmarks, etc.), secondly of each parcel of 500 hectares within that concession. The final granting of a concession for further exploration depends upon acceptance of the survey by the Mines Department. Since a large proportion of Venezuela has been considered as potentially oil bearing, a great deal of the country has been mapped in this way. A map of Venezuela showing the area of concessions granted by the Government to petroleum concerns indicates that some three-quarters of the country north of the latitude of the Orinoco has been surveyed under the mining laws.

These surveys are of course additional to those of the various government departments such as the Ministry of Public Works. Government and industry cooperate in these surveys. There is the record recently of the arrangement by which an oil company should make a triangulation for the government of the mountainous district between Merida and Trujillo across the Paramo de Mucuchies, including the Sierra de Merida, a plan which fell through from lack of funds.

In the field of public works roads have grown with the post-war boom in oil. The era of Venezuelan railways fell into the '80's and '90's of last century; roads in the '20's of this. Paved roads however are restricted to the Federal District, and to the neighbouring seaboard States, of which between La Guiara, Caracas, Valencia, and Puerto Cabella there are some 600 kilometres. A more ambitious project has been the completion in the '20's of the great trans-Andean highway linking the capitals of Venezuela and Colombia. In the Andes between Valera and Merida this highway crosses the Paramo de Mucuchies, over 13,000 feet above sea-level: a fine engineering feat. But other sections, as between Barquisimeto and Carora, hardly live up to the status of an international highway, and torrents in the rainy season may hold up traffic for weeks at a time. A more direct route is projected between Barquisimeto and Trujillo.

The major road projects of the last three years have been the work of petroleum interests as a contribution to national development. The first, completed in 1940, is a highway down the east coast of the Lake of Maracaibo, linking Maracaibo with the trans-Andean highway at Motatan, and with each of the Bolivar coast fields in turn; a magnificent highway, cut die straight for many kilometres through the Llanos and forest. This road has opened access to the State of Trujillo as railway and steamer never did, and has brought Merida within ten hours of Maracaibo. The discovery of oil fields in eastern Venezuela has led to the construction of a 150-kilometre road due south from Puerto la Cruz to Oficina, more than half-way to the Orinoco. This is the first paved road of regional importance in the eastern part of the country, and is likely to give impetus to the linking of the Caribbean seaboard with the Orinoco valley.

In the development of aviation, the Pan-American Airways and Venezuelan Government have between them covered the country with a network of air routes. The Pan-American maintain the coastal routes from Port of Spain in Trinidad to La Guaira (Caracas), Maracaibo, and Barranquilla (Colombia), which link with their North and South American services. The Venezuelan national services link the interior with the coast, Cuidad Bolivar, Barinas to the south of the Andes, and San Cristobal near the Colombian frontier with Caracas and Maracaibo. The larger petroleum companies maintain private aeroplanes. From Maracaibo into the Apure Basin is two hours' flight across the Sierra de Merida instead of four days by boat, train, car, and pack-animal.

The photographic survey of the country from the air has led to the mapping of some areas by private concerns and by the Government, but a Civil Aviation Law in 1936 prohibits aerial photography by any but the State. Though the areas mapped have been considerable, they are still a small part of this vast country.

The new road between Puerto la Cruz and Oficina, laying 16-inch pipe-line

Bolivar coast road between La Rosa and Lagunillas

Bolivar coast road between Lagunillas and Bachequero

The trans-Andean highway, a village near Tabay

Inn at Mucuchies, on the trans-Andean highway

The Ministerio de Fomento is the government department concerned with the country's mineral resources. As regards mines, its most immediate function is supervizing the technicalities of the petroleum industry; but it has further interests, and aims at creating a body of scientific knowledge of geology and mining. With the object of furthering interest in Venezuelan exploration, the Ministerio convened two geological congresses (1937 and 1938) to which all geologists in the Caribbean region were invited. The two volumes of proceedings testify to the value of these conferences; and the annual bulletins of the Ministerio itself do not fall short of them. Its interest likewise includes the most extensive of the unexplored regions of Venezuela, the Guyana Highlands, which lie north and west of the boundaries of Brazil and of British Guiana. Of this area, somewhat less than half that of the whole country, little is known; there are scarcely any roads south of the Orinoco, travel is by mule or on foot. The larger rivers are unnavigable owing to rapids, unless with *curiaras* which can be carried. Expeditions sent out by the Ministerio de Fomento during the last three years have greatly added to our knowledge of this country. The investigation of mineral resources had been the main concern, but geological, botanical, and ethnological reports are included.

Mention should also be made of the activities of the Sociedad Venezolana de Ciencias Naturales whose first president, the late Dr. Alfredo Jahn, who died in June 1940, was perhaps the foremost Venezuelan geographer of his time. He was an engineer by profession but his works deal with geology, glaciology, meteorology, and botany; his was the first survey of the Coast Ranges and the first mapping of the Sierra de Merida. The contributions to astronomical surveying by Dr. Röhl, now President of the Society, also deserve special attention.

But if a great deal has been done, in this vast country, there remains even more to do. Before the coming of oil such progress as there was in geographical science had been the work of individuals, men like Humboldt, Bonpland, Codazzi, Karsten, Sievers, Jahn, and others. The petroleum industry speeded up progress incredibly. Within two decades the country advanced a hundred years, for there are many in this great industry whose interest and talent are given to the wider interests of the country in which they work, and the sum of their contribution is not easily estimated. But nowadays national progress in science has become too big a thing for independent research; the day of the universal naturalist of the nineteenth century is past. To make progress corporate organization is required, and if scientific exploration is to continue it devolves upon the government to assume the responsibility for initiative and planning, and to assure grants in aid.

(*To be concluded*)

FOOD PRODUCTION IN WESTERN EUROPE

FOOD PRODUCTION IN WESTERN EUROPE: an economic study of agriculture in six countries. By P. LAMARTINE YATES. *London: Longmans, Green and Co.*, 1940. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xvi + 572 *pages; illustrations and sketch-maps.* 15*s*

MR. YATES has analysed the agricultural structure and policy of six western European countries which he visited during a tour undertaken in 1938 on behalf of Lord Astor and Mr. Seebohm Rowntree. He has endeavoured, while following out his own lines of inquiry, to give descriptions that would be accepted by experts in the countries concerned. In these countries—Denmark, the Netherlands, Belgium, France, Switzerland, and Germany—the fundamental conditions, considered broadly, are very similar, yet the directions in which their agriculture has developed show marked differences in detail, so that they permit the study of the relative importance of natural conditions, historical development, and policy. It might be thought that in view of its date and of the present conditions of Europe the study would have lost much of its interest, and that it now possessed a historical interest only. Most of these countries have indeed been subjected to violent changes in their economic structure, and their former policies have perforce been drastically altered; yet many of the conditions affecting their agricultural development still hold good and control the extent of possible changes. In the reconstruction of the European economic system after the war, whatever form it may take, these considerations also will have to be taken into account. The material here assembled so lucidly has a further value. There is an increasing interest in the future of British farming: though Mr. Yates does not include Britain among the countries reviewed, her methods, experiences, and results are constantly used to illuminate his accounts of continental farming, and for the discussion of future British policy his book provides useful and important material.

The two general questions which he sets out to answer are the extent to which agricultural development in these countries has been in the public interest, and the methods by which agriculture can best be planned to take its place in an enlightened and enduring economic structure. In treating the first question he examines aspects such as the advantageousness or otherwise of retaining a larger proportion of the population on the land, and the effect of various policies upon output, wages, and standard of living. Three chapters are given to each country; the first, introduced by a very compressed geographical summary, deals with crops and stock, the second with farms and farmers, in which tenure, profits, capitalization, education, housing, and health are examined, while the final chapter discusses the aims and results of state intervention. To assist comparisons the author gives numerous statistical tables; as he recognizes, the available figures cannot always be strictly comparable, especially where a monetary value in pounds sterling is assigned, but, taking real values into consideration, they assist in ranking the countries in an approximate order.

France and Switzerland, on account of high protective tariffs and certain individual characteristics, are rather special cases and it may be of more interest here to deal briefly with countries where developments have a greater interest for British students. Denmark, for which Mr. Yates has much regard, based her agriculture on the provision of fodder for livestock, and the prosperity of the industry depended upon the carefully built-up export trade, particularly in butter and bacon. The high yields of crops necessary on account of the restricted

area, were obtained by the use of good seed, much fertilizer, and machinery. But if Denmark depended upon a free export market, she also required the unrestricted import of fertilizers and cattle food. Historical causes have favoured the establishment of small holdings and the control of enclosure, resulting in compact farms worked by owner occupiers. Capital has also been available for intensive methods and mechanization: actually 80 per cent. of the capital in farming is borrowed, and the mortgage interest is stated to average £1 per acre, which tends to obliterate the distinction between ownership and tenancy. The author calculates that the earnings per week of a smallholder averaged thirty shillings, and of a family farmer forty to fifty shillings, figures which should remove any exaggerated idea of the prosperity of Danish farmers. He concludes that Danish farming owed its success to the utmost exploitation of resources for the world market.

Holland, like Denmark, had before 1914 depended for agricultural prosperity on her export trade, which permitted the import of much of the grain needed for human food. This system however received a rude shock from the depression of 1931. Much more grain had to be grown at home, and the wheat acreage was increased from 112,000 acres in 1929 to 380,000 acres in 1935, a very considerable achievement, no other European country having so high a proportion of farm land under grain or, except Belgium, under roots. This striving for self-sufficiency in food, and the attempt to absorb the industrial unemployed into the rural community, made Holland the sole country in western Europe where the agricultural population was increasing. The less satisfactory side to this development was the rise in rents due to the strong competition for the available land, and the saddling of the farmers with heavy debts, added to which the general level of prices was high. The small and scattered holdings have made the use of machinery difficult, though there was a heavy expenditure on fertilizers. The state endeavoured to meet the situation by reclamation on a large scale, but the number of persons which could be absorbed thus was relatively small, and the author concludes that the surplus rural population could only be absorbed by migration overseas or to the cities, a solution which requires international economic revival.

The chapters on Germany depict an agricultural organization already considerably planned for self-sufficiency. For many decades German farmers, particularly the wheat growers, had been highly protected, and increasingly drastic measures had been taken to assist farming in general. Mr. Yates' description of bureaucratic control nearing the point at which it threatened to strangle the industry is interesting. With it all, state policy had failed to check the drift to the towns, one million rural workers migrating to the towns in the years 1935–39. This was due no doubt to some extent to expanding industry, but also to high costs of production, resulting in a low standard of life for the workers and a gap between industrial and agricultural wages. These costs are the result in part of the poorness of much of the soil, requiring much labour and fertilizer, in part of the state policy of keeping as many peasants as possible on the land, almost at any price, so that uneconomic methods and little machinery are employed. The result is that the average income from farms of 50–100 acres is estimated at the exceedingly low figure of £46–£60 a year. Of course by subsidizing agriculture, directly and by protection, Germany had very nearly achieved self-sufficiency, though in normal times a certain amount of cattle food had to be imported. The author concludes that the provision of adequate fodder supplies is the crux of the problem; self-sufficiency both in grain and in fodder is impossible for Germany, and the only solution would be closer economic relations with certain east European countries. Yet in the years before the war Germany

was already importing grain equal to four times the total export of Hungary, or 50 per cent. more than the Romanian export, though part of this may have been for storage.

In his final summary, the author gives some striking comparative figures: for example, in 1937 for each worker engaged in agriculture in Great Britain there were 33·8 acres of agricultural land and 10·3 livestock units, and for Denmark the figures were 15·7 acres and 8·4 units; on the other hand to France they were 11·6 acres and 2·8 stock units, and for Germany 7·9 acres and 2·8 units. The nett annual output per worker reinforces the uneconomic character of much continental farming; it is calculated as £200 for Great Britain, £155 for Denmark, £90 for France, and £70 for Germany. The figures for Britain reflect the influence of larger holdings, mechanization, and concentration on higher priced food-stuffs. There is of course another side to this; the degree of self-sufficiency reached by each country. This aspect is not the special concern of Mr. Yates, but the following figures are of interest to-day: in 1937 British agriculture was providing for each hundred of the population about 25 acres of arable and 24 livestock units, while German agriculture was providing 46 acres of arable, exclusive of industrial crops, and 40 stock units.

At this stage the ideas inspiring the author's final conclusions and their application to British policy are clear. Agriculture is in a healthy state from the national point of view when the pressure of population on land is not excessive, holdings are of sufficient size to permit the use of the most up-to-date methods, capital is available for development, and the agricultural system is adjusted with enterprise to international economy. He also emphasizes the point that a prosperous industrial community, besides contributing to the above conditions, provides a demand for the more expensive protective foods, for which there is in general a sheltered market, and so raises the rural standard of living. It is, he believes, impossible to achieve a high degree of autarchy, and at the same time to maintain a large number of small cultivators and to provide a reasonable standard of living. In normal times therefore he would prefer to see British farming concentrating upon food-stuffs of high health value, looking to industry, through the export trade, to pay for those other foods which can be more economically produced overseas. Such a policy may appear to be coloured more by political, industrial, or imperial theories than by agricultural, but it receives much support from this study. A policy, which at least in the case of Britain, would blend agricultural and industrial interests harmoniously has, if successfully demonstrated, considerable attractions. The older economic theories are perhaps somewhat discounted to-day, but Mr. Yates shows that there is still much to be said, in a sane international order, for the maxim of Quesnay's which he quotes: "To produce the maximum with the minimum of effort is the ideal of economic behaviour." G. R. C.

REVIEWS

EUROPE

UKRAINE AND ITS PEOPLE. By HUGH P. VOWLES. *London: W. and R. Chambers*, 1939. 8×5 *inches; 224 pages; sketch-map.* 5*s*

THE UKRAINE, a Russian land. By PIERRE BRÉGY and Prince SERGE OBOLENSKY. *London: Selwyn and Blunt*, 1940. 8½×5½ *inches; 260 pages; sketch-maps.* 12*s* 6*d*

HISTORY OF THE UKRAINE. By D. DOROSHENKO. Trsl. fr. the Ukrainian and abridged by HANNA KELLER. *Edmonton, Alberta: Ukrainian Self-reliance League*, 1939. 9×6 *inches; 702 pages; sketch-maps.* $4

The Ukrainian problem, as compared with other nationality problems in Europe, is normally of only secondary importance and might be regarded as a matter of Russian internal policy, for the politician or the historian rather than for the geographer: few but the most extreme nationalists pretend that the Ukraine has any serious geographical, racial, or linguistic claims to independence. But the thirty or forty millions inhabiting the black soil belt between the Carpathians and the Urals have good reason in history for differing materially in outlook from their neighbours to the north; and for this reason the books under review, though mainly historical, are worth the geographer's consideration. Moreover the overrunning of Poland and the proclaimed intention of her conquerors to acquire land to the east add interest to the study of boundaries which, in the absence of any physical differentiation, have shifted during the last thousand years to an extent which makes those of western Europe seem relatively stable.

Mr. Vowles' book, published shortly before the war, is brief and eloquent; he is an engineer, interested primarily in the well-being of the peasants. His opening chapters on the land and its peoples are the best, and he deals only episodically with the history of the Ukraine. In his chapters on land reform in western and Soviet Ukraine, though obviously anxious to be fair to the efforts made in Poland, Czechoslovakia, and Romania, he does not conceal his own view that the multiplicity of peasant holdings brings no relief to the peasant, and that the large-scale enterprise of the Soviet is much to be preferred. He has therefore small sympathy for Ukrainian national movements which seek to build a barrier between Ukraine and Moscow.

Slightly more substantial is the joint work by Brégy and Obolensky: their sub-title makes their position clear and reflects anxiety aroused by German interest in the "Autonomous Sub-Carpathian Ukraine" during the brief period of its existence 1938–39. They deal with the history, economics, art, and intellectual life of the Ukraine, ending with their most interesting chapter on the aims of the various Ukrainian groups working outside Russia. On their last page they welcome the reincorporation of Galicia into Russia. The tone of the book is moderate, but the information is scrappy and the translation remarkably poor.

Professor Doroshenko's work is by far the most solid of the books under review. The translation is not perfect: the tone is dull and the phrasing conventional and reminiscent of the textbook, which is perhaps due to abridgement. But the book sets fairly in perspective the history of the lands centring on Kiev and the Dnieper: of its six hundred and fifty pages only fifty deal with

events from 1914 to the present day. It is upon their rôle in the past as creators of Russian Orthodox civilization, which they supported against the Catholic Poles in the west or against waves of barbarian invaders from the east, that Ukrainians seem mainly to base their present claims to independence of Moscow: Kiev was the heart of the original Rus a thousand years ago, when Moscow was still the frontier land implied in the name "Ukraine." Centuries of struggle to maintain existence on the featureless plains of South Russia, and memories of the intermittent periods of prosperity based on a flourishing export trade, are responsible for an independent outlook which makes the Ukraine an unwilling partner in any government centralized in Moscow. Of such a spirit the Cossack State was evidence: when that state had perished the same spirit was maintained largely by the influence of the marginal lands (Galicia); in 1941 their rôle has not changed. Professor Doroshenko's emphasis on the shifting boundaries and centres of civilization in eastern Europe is timely.

None of these three books are well equipped with maps: there are a few sketch-maps in Brégy and Obolensky, a few more in Doroshenko, and an end-paper map to Vowles. An Atlas of the Ukraine (ignoring 1938 national boundaries) was however published in 1939 in Lvov, and goes far to make good the defect. It contains sixty-six sheets of maps and diagrams in colour, $8\frac{1}{2} \times 16$ inches, tolerably printed and supplied with adequate legends. The introduction, in Ukrainian and English, though queerly worded, supplies some economic information; the authors made a worthy attempt to coordinate statistics drawn from Russian, Czech, Polish, and Romanian sources (duly listed). The maps cover the physical geography of the Ukraine, population, language, industry, agriculture, transport, etc. The historical section is particularly useful, especially on the spread of Ukrainian propaganda in Poland.

Mr. Vowles lists a few English sources only; Brégy and Obolensky give none at all. Professor Doroshenko includes appendices of dates, etc., and a useful bibliography. He is clearly much indebted to Hruchevsky, the shorter version of whose history of the Ukraine has still much to recommend it. J. P. H. M.

SCANDINAVIA, THE BACKGROUND FOR NEUTRALITY. By ALMA LUISE OLSON. *Philadelphia: J. B. Lippincott Company*, 1940. $5\frac{1}{2} \times 8$ *inches;* 386 *pages; end-paper maps.* 14*s*

Most people will be puzzled by the outer cover of this book, which reads 'Scandinavia, the struggle for peace,' and they will not be greatly enlightened by the book itself. It is in fact a somewhat haphazard collection of Miss Olson's impressions of the various Scandinavian countries and Finland, punctuated by factual matter of doubtful correctness. History, scenery, personalities, sociology, literature, and art jostle one another on every page. There are scattered and conveniently vague references to Scandinavian unity which Miss Olson agrees is merely cultural; to the unwillingness of the Scandinavian countries to implement their obligations as Members of the League (Miss Olson does not admit the obligations); and to the numerous assertions of Scandinavian neutrality. Miss Olson seems to consider these things, particularly declarations of neutrality, as contributions to world peace. At the same time the present war is for her a "War of the Mighty," a war "waged on behalf of the balance or unbalance of power," an "Imperialist War." While she avoids saying so openly or clearly, every reference to "Great Powers" implies that all are equally culpable, while the smaller Powers are the innocent victims of their rival ambitions. Her hasty and ignorant treatment of the events preceding the invasion of Norway is a particularly gross example of this. M. S.

ASIA

INNER ASIAN FRONTIERS OF CHINA. By OWEN LATTIMORE. *New York: American Geographical Society (Research Series, 21)*, 1940. 8×5½ *inches; xxiv+586 pages; sketch-maps.* $4

No one could be better qualified to write this important book than Mr. Owen Lattimore. His initial interest in the Chinese borderlands, acquired in the course of a business appointment in the Far East, stimulated him to undertake both extensive and purposeful travel in most of the regions formerly included within the Empire, and also arduous research in Chinese, Mongol, and Russian historical materials. The result is a massive and closely-packed book which bears the hall-mark of mature and well-considered judgments on a very complex and difficult theme and, to a quite unusual degree, combines academic scholarship with practical first-hand knowledge of the vast area which comes within the author's purview.

The title of the book scarcely suggests the width of its scope either in space or time. The area considered includes virtually the whole terrain of Central and Eastern Asia with which China has had close contact, and the time sequence embraces a detailed survey of the different forms of social evolution from the neolithic to the imperial (Ch'in and Han) age and a broader but most suggestive discussion of modern developments and contemporary tendencies and possibilities. The book is divided into four Parts. The last three of these deal in sequence with the historical evolution: (Part II: "The Legendary and Earliest Historical Ages." Part III: "The Age of National States." Part IV: "The Imperial Age"). Part I "The Historical Geography of the Great Wall" is almost complete and self-contained as an outline survey of all the major entities—Mongolia, Manchuria, Oases and Deserts of Central Asia and Tibet—constituting, in the author's sense, "China's Inner Asian Frontiers." In this Part, too, the evolution and clash of the contrasted economies and social systems are traced through all the various phases of development but, in addition, there is an arresting discussion of the contemporary situation and its possible or probable outcome. Sir Halford Mackinder's dictum that "the present is the past flowing into the future" will often come to mind as we follow Mr. Lattimore's interpretation of the human drama which is being unfolded on this significant part of the world stage. This first Part of the book is of special interest to all students of Far Eastern politics. It is more lucidly written and less laboured than is much of the later portion of the book and, in view of its wider appeal and contemporary significance, might very usefully be published as a separate monograph, perhaps in a somewhat extended form.

To students of historical geography however the three later Parts are of great value. They contain much the most searching and complete analysis of the differentiation between Chinese and the neighbouring nomadic, pastoral societies of Inner Asia and of the real nature of the historic conflict between them that has yet appeared. In particular the rôle of the border zone in determining the relationship is presented in a new light. The thesis that it was the pressure on the people of the steppe margin by the evolution and outward expansion of the Chinese type of agricultural society to the limits of the terrain adapted to it which brought the true steppe society (*i.e.* complete pastoral nomadism) into existence and that the latter is a relatively late historical phenomenon, first fully exemplified by the Hsiungnu organization contemporary with the imperial age of Ch'in and Han, is argued with great force and cogency. It opens new avenues for exploring the whole problem of the relations between "the steppe and the sown." Although some of Mr. Lattimore's contentions in this field must at

present be accepted with reserve, there can be no doubt that he has made a very notable contribution to the literature of social and related political geography.

The book is also a challenge—perhaps an unconscious one on the author's part and certainly not at all provocatively presented—to ponder afresh the old but vitally significant themes of the philosophy of history and its relations to geography. Mr. Lattimore's approach is clear-cut. "Political events," he says on p. 340, "are only the surface phenomena of history. The forces that create them lie deeper, and these forces derive from the interaction of society and environment. The beginnings of history, depend on the scope that this environment allows to a primitive and weak people. Further development works itself out as a complex product of the initial momentum, the degree in which the environment stimulates or retards the society, and the degree in which the society can free itself of control by the environment and establish instead control of the environment." The last sentence indicates his escape from a purely determinist attitude, but the bias of his book is undeniably on the economic interpretation of history. The author sees as virtually inevitable, given the conditions of the stage in Central Asia and the Far East, the development of "processes by which different environments have generated different economic systems which in turn have nourished mutually hostile societies." In all the earlier and middle phases of the evolution he seems to allow very little choice for human initiative. The significance of Confucianism in China and the rôle of Buddhism in Tibet and Mongolia are discussed almost entirely in terms of regional socio-economic and political conditions. At times he seems to oversimplify the issues and to claim too much for economic interpretations, although the force of these criticisms may be weakened by the reflection that he is concerned in this book with only one, although a supremely important, aspect of human evolution.

But whatever his judgments on this issue in the more remote past, Mr. Lattimore is emphatic in his emphasis on the responsibility of modern man, equipped as he is with the means of controlling his environment, for the shaping of future developments. "Historical study of the Inner Asian Frontier and of the relation of different kinds of society to different kinds of environment," he says, in the concluding paragraph of his book, "offers the possibility of appreciating each new phase as it takes form and of participating in and helping to shape the events of our time instead of passively submitting to them."

The vital new factor in the historic relationship of the two antagonistic types of Asiatic society is the advent of industrialism which, as he contends, is "the only bridge that can really integrate a society that is essentially agricultural with one that is essentially pastoral." But so far industrialism in Eastern Asia has been mainly under alien control. Both in the case of the primary imperialism of the Western Powers and of Japan in China and that of what he terms the "secondary" imperialism of China in her modern relations with the Mongols and other border peoples (a secondary imperialism based upon the first and developed as a counter to it) agriculture and the peasantry have been subordinated to the new forms of industry and finance and the ruling class which they create. Industrialism, he argues with great force, "can integrate farmland, steppe and forest" for the common good and resolve the ancient antagonisms only if it is freed from alien control and represents the spontaneous expression of new popular activities. Mr. Lattimore may or may not be justified in his contention that this is already taking place with very favourable social results in Outer Mongolia and other peripheral regions of the former Chinese Empire which have come within the influence of the Soviet Union. What can hardly be doubted is that the striking development of new forms of industrial cooperation in Western China, as a result of the Japanese occupation of the older centres of factory industry on

the eastern sea-board, and the new orientation of ideas which the Chinese people as a whole are acquiring in the course of their present "war of liberation" are likely to be favourable to this new and much-needed type of integration.

There is a fairly full bibliography and an adequate index. The few maps are mainly diagrammatic. Although effective they tend to be too small and the legend is not very clear. P. M. R.

CENTRAL AND SOUTH AMERICA

MEXICO, a new Spain with old friends. By J. B. TREND. *Cambridge University Press*, 1940. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 185 pages; map. 12s 6d*

Mexico has been described by someone who had no choice but to live there as a delightful country to visit. Professor Trend's enjoyment of his two visits was heightened by the fact that he met in Mexico numerous Spanish friends whom he had known in Europe, and found them, exiled indeed, but exiled to a land not wholly foreign, the political complexion of whose Government made refugees such as they fit subjects for an enthusiastic welcome.

Professor Trend is not only concerned with people, whether Spaniards or Mexicans. He made numerous trips into the more accessible parts of the country and has recorded his observations on architecture, vegetation, the manner of life of the less impoverished classes, and the forms of language, Spanish and Indian, current in Mexico to-day. Although his descriptions of a beautiful and savage landscape lack the vividness of some less academic writers, yet he notes the interesting features of climate and vegetation with a straightforward clarity which will appeal to the lay reader. The journey by air from Brownsville to Mexico City is particularly well described, though it is not altogether obvious how, approaching the capital from the north-east at 12,000 feet, Professor Trend saw the top of Popocatépetl through breaks in the clouds below. In the sphere of architecture he shows more enthusiasm for pre-Conquest relics than for the products of the colonial period. The Maya ruins at Chichén Itzá, to which he devotes a whole chapter, are clearly and vividly described and the accompanying photographs well chosen. Although an earlier chapter is entitled "Pyramids" the author refrains from giving a detailed account of the rather sinister remains of Teotihuacan; but they prompt a further chapter in which some Toltec legends are engagingly retold and discussed. Whether by chance or owing to reaction from the recent tendency to write of Mexico from a strongly religious point of view, Professor Trend, in discussing colonial architecture, touches comparatively lightly on the monasteries, cathedrals, and churches which are so superb a testimony to the Spanish culture which once flourished in Mexico; and this is the more surprising in that his enthusiasm for Mexico seems to spring largely from that country's association with Spain. In any case it is strange that the splendid and famous cathedral and monastery buildings of Tepozotlán find no mention in a book of this type.

By far the most interesting chapters are the two which treat of the languages of Mexico. The problems facing a congress of linguists and philologists attempting to devise an alphabet adaptable to anything from Aztec to Chinantec are perhaps of limited interest to European readers, but the author's references to the historical aspect of the subject are valuable. The practical significance of such conferences and the probability of any steps actually being taken to solve "the problem of rural education, specially dear to President Cárdenas and all Mexicans of good will" is a question outside the scope of this review. In addition

to being a Spanish scholar Professor Trend is knowledgeable in the sphere of music, and this may explain the quite exceptional merit of his chapter on Mexican Spanish. Spanish as spoken in this half-Indian country must surely be among the most musical languages of the world, and to his acute appreciation of the "soft and gentle voices of Mexico," Professor Trend has added the understanding of an expert linguist. To one familiar with the rise and fall of *mestizo* speech it is delightful to find each characteristic of pronunciation, vocabulary, and above all intonation, noted and described with an unfailing touch. The suggestion, made earlier in the book, that the correct pronunciation of *Popocatépetl* is best learned by singing it to the opening notes of *La donn' è mobile* is pure inspiration, but I would differ from Professor Trend so far as to suggest that, in the name of the other great volcano, Iztaccíhuatl, the first *c* is often pronounced hard at the end of the second syllable: *istac-siwatl*. Whatever may be thought of the author's references to contemporary politics, his historical divagations are always apposite, and this is particularly true of the observations which arise from his consideration of the theory that Mexican Spanish possesses many Andalusian characteristics which have come straight down from the days of the *conquistadores*.

Professor Trend's Mexico, as he himself has almost said, is a through the looking-glass country, but nevertheless his book contains much that is accurate and interesting, if rather less that is new. It has an index and a clear and adequate map. J. O'M.

SOUTHWARD HO!: a treasure hunter in South America. By WILLIAM LA VARRE. *London: Heinemann*, 1940. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 258 *pages;* 15 *photographic illustrations.* 12*s* 6*d*

Most of the sketches in this determinedly sprightly volume appear to have been planned for the juvenile readers whom the author is said to please; the adult reader even slightly acquainted with South America could scarcely be expected to take them seriously. A series of disconnected chapters present varied aspects of Mr. La Varre's adventures, invariably from the subjective point of view. None are dated, but they bear the marks of age; there are few place-names, and these frequently misspelt, and no maps. The words "mucho" and "caramba" (*sic*) occur frequently in pages of conversation with people of Spanish and Portuguese speech, but one cannot avoid the suspicion that the author's acquaintance with these languages is as light-hearted as his study of plant life; to him the potato is a "lowly fungus," and banana "trees" are "pruned" for six months until at nine months they "begin to grow"!

Mr. La Varre's travels convinced him that no Maya, Aztec, nor Inca people exist to-day; but he was able to find innocents who eagerly accepted trade mirrors and cheap cloth in exchange for forest goods. Many familiar features in the recounting of South American wonders are present: secrets of fabulously wealthy gold mines, revealed to the author alone; caches of Inca treasure; natives hung all over with golden ornaments; and tropic islands full of beautiful native girls, those of San Blas being given as an example. We are not even spared an account of rubber collection nor of the shrunken heads of Ecuador. One chapter appears at first sight to have been framed fairly recently: but it describes the introduction of high-grade sheep into Peru, an event which took place at least thirty years ago.

The author's photographs are technically adequate, but only two are of general interest, and these show ruins already much photographed. L. E. J.

ECONOMIC AND HISTORICAL GEOGRAPHY

CAMBRIDGE HISTORY OF THE BRITISH EMPIRE. Vol. II. The growth of the new Empire, 1783–1870. Edited by J. H. ROSE, A. P. NEWTON and E. A. BENIANS. *Cambridge: University Press*, 1940. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xii + 1068 *pages*. 50*s*

This, the penultimate volume of the Cambridge History, treats of a well-defined period in the development of the Empire, tracing the course of events from the Treaty of Versailles in 1783 which closed the War of Independence, to the point at which a conscious imperial policy, supported by public interest, became manifest. Other volumes have dealt with the history of India and the growth of the Dominions. The first purpose of this volume therefore is to complete this survey for the Crown Colonies, widely scattered and presenting a variety of individual problems, and to discover the central administrative system. This aspect, apart from specialized monographs, has received relatively little attention, and it is convenient to have the results of research set out clearly and concisely. The tale of local conflicts of interests, personal rivalries, and constitutional difficulties is perhaps of limited appeal; the general reader, interested in themes common to the Empire as a whole, will turn more readily to the chapters on the growth of self-government, the economic bonds, the progress of settlement and of communications, and the anti-slavery movement. The definition of the scope of each chapter has sometimes presented difficulties, and some slight overlapping has resulted; each chapter however has its own unity. The usual extensive bibliography of manuscript and printed sources completes the volume.

The importance of economic questions is immediately apparent, and these supply the framework of much of this volume, overshadowing the treatment of positive imperial theory or the trend of public opinion. Professor Holland Rose's account of the Revolutionary and Napoleonic wars is built around the economic struggle: he emphasizes particularly the importance attached by both sides to the West Indies. Thus Villeneuve's dash westwards was conceived not merely to lure Nelson away from European waters, but as an assault upon one of the main foundations of England's commercial structure. Sea power was also employed to isolate the Continent, and simultaneously to maintain those loop-holes, among them Heligoland and Malta, through which, despite Napoleonic prohibition, colonial wares were poured into Europe. Occasionally the writer's judgments seem conflicting, for example in his estimate of Pitt; and his characterization of the nineteenth century as "materialist, disillusioned, and exhausted" surely requires qualification.

But the economic interest penetrates much further than this, and its prominence is explicable by the virtually unchallenged doctrine of the age. Stimulated by the liberal theories of Adam Smith, and presented by the French wars and domestic industrial advance with a unique opportunity to expand and almost to monopolize world trade, the directors of British policy, sought no alternative sphere for territorial expansion on the loss of the American colonies, but turned their energies to consolidating and advancing their share of the world market. In this attitude they were, to their great profit, confirmed by discovering that the American market was much more valuable after independence than it had been before, and very soon outrivalled the pillar of the old empire, the West Indian colonies. The growth of trade with the independent South American states also induced an attitude of indifference to the granting of self government to the colonies. Free trade was all, provided its channels were maintained in British hands, in Mr. Fay's words: "although imperialism was at a discount, empire itself was at a premium." His quotation from Mr. Gladstone's budget speech of

1853 is an apt expression of the extreme development of this doctrine: "where we were not able to lower the foreign article to the level of the colonial, we have not thought it would be considerate in any case to raise the duty on the colonial article." It is emphasized however that most of those opposed to the colonial connection would have regarded the present Commonwealth as an inspired solution.

This policy had its less pleasant aspects as contributors are not slow to emphasize: one sums it up in the mordant phrase, "By the aid of cheapness and an illegal drug 'free trade' England conquered the East commercially": another shows how it produced the combination of indifference and self-complacency with which the pitiful stream of emigrants pouring in millions out of the country, for the most part across the Atlantic, was generally regarded. But against this background of triumphant *laissez faire* there stood out the philanthropists who carried the emancipation of the slaves, improved the lot of the emigrant, and fought the system of transportation, an enthusiast for ordered settlement like Wakefield, and many of the officials of the Colonial Office. This department, in its relations to the Crown Colonies, at first tended towards autocracy, largely on account of abolitionist pressure: with respect to the colonies of settlement it came gradually to stand for a reserve of practical experience, while maintaining its control of imperial defence, and was thus able to influence their policies indirectly.

During this period of what might be called imperial interregnum however, when the eventual independence of the colonies was accepted almost as an axiom, economic progress was forging a powerful link. For reasons here expounded in detail by Cambridge economists, the demands of the colonies for capital, the increasing speed of communications and transport, and the evolution of commercial technique, made Britain the organizer of Empire trade, though the colonies became increasingly protectionist in outlook.

While European countries inclined momentarily towards economic liberalism of the English type, and no rival power emerged, for France was never free for long seriously to challenge Britain, the loosely knit association held together, partly no doubt from mere conservatism: with the quickening of international trade competition and the emergence of power politics at the end of the period, it was turned back upon itself, to find that from the almost contemptuous liberalism of the earlier years was to spring much of its intrinsic strength: the later proponents of the Disraeli school, it might be argued, were to reap where they had not sown. G. R. C.

THE LOCATION OF INDUSTRY AND THE DEPRESSED AREAS. By S. R. DENNISON. *Oxford University Press*, 1940. 9×5½ *inches;* viii+216 *pages*. 10*s*

Professor Dennison writes of the location of industry as an economist: as one moreover reared in the Manchester School, although he has been subjected to an environmental change and now teaches at Swansea. It is therefore inherent in his method of approach to the problem of location that particular geographical circumstances must be eliminated; and yet these are often the very essence of location. He himself admits that this fundamental weakness characterizes Weber's well-known and too uncritically accepted general theory of location, expounded in 'Uber den Standort der Industrien.' The chapter in which Weber's theory is briefly discussed is prefaced by a dialogue between Alice and the White Knight from 'Through the Looking Glass.' The latter is carrying his little box upside down to keep out the rain, but he has failed to notice that the contents have consequently disappeared. Later chapters are headed by snatches

of dialogue between certain witnesses and the Chairman of the Royal Commission on the Location of Industry, doubtless chosen because like the conversations in "Alice" they appear on first reading quite matter of fact, but are seen on reflection to contain elements of the fantastic.

The book is divided into two parts, the first dealing with localization, and with the changed location of industry, the second with the depressed areas as potential industrial locations. The author's major purpose is to deal critically, and if possible constructively, with the Government's policy towards the latter. Although alive to the weaknesses of the Manchester doctrine of *laissez faire*, he rightly emphasizes the fact that planning when applied to transference of workers or of industries, should be based on a much more intimate knowledge and a keener analysis of the factors involved than has hitherto been the case. Actually his own analysis, like those of the Board of Trade and of Professor Florence, working on the localization index, is largely vitiated by the non-homogeneous regional categories under which the relevant statistics are grouped. Professor Dennison divides England and Wales simply into "North" and "South" without any definition or bounding of these entities. The former he finds to be declining, the latter expanding in industrial prosperity. But of what practical value can so vague a generalization be? It contains of course elements of truth dependent partly on the fact that the expanding industries are the newer industries, organized primarily in respect of the home market, and only secondarily in respect of the severely constricted world market. The maximum of purchasing power is to be found in Metropolitan England, which attracts the wealthy and leisured classes, and does in fact lie in the south.

It would seem an easy matter to ascertain the principles upon which location of industry is based by asking individual manufacturers why they chose particular factory sites. The Board of Trade does collect information of this character, but the results are indeterminate, partly because no general questionnaire can be suitable for all types of industry, and partly because the answers are grouped under such coarse categories that they cancel one another out. "Chemicals" for example includes the making of "heavy chemicals" now very strictly tied to the fundamental raw material, common salt, the making of drugs, into which raw materials from all parts of the world may enter, and the making of face creams which depend for their success largely upon clever advertising. Under the head of "timber" again, come the making of gramophone cabinets and of poultry houses. Electrical industries include cables and wireless sets, and the considerations governing the location of their manufacture can have nothing in common. This question of the heterogeneous grouping of industries indeed is a point of weakness in Professor Dennison's analysis equally with his choice of heterogeneous regional categories. Rejecting the division often made into heavy and light industries (based on the employment of predominantly male and female labour), he makes a grouping into expanding and declining industries, necessarily tying it to a particular period of years. Even within such a period an industry might pass from one category to the other, and the classification is therefore a shifting one. A pair of categories that might have been chosen since they have an obvious relation to location is that of consumers' goods and producers' goods. It is the former that so conspicuously "seek their market," namely the general purchasing public, and are largely responsible for the so-called "drift to the south." The latter have a circumscribed and specialized market which may have no relation at all to distribution of purchasing power, and may call either for specialized or unspecialized location according to the nature of the goods being made.

The results of Professor Dennison's study are indeterminate, as were the

P.E.P. memoir on the same subject and the evidence tendered to the Royal Commission. Yet enough has been said to indicate that this does not necessarily imply that the localization of industry is indeterminate. The methods of analysis employed by Professor Dennison and others, if only they would search for homogeneous categories, would undoubtedly produce conclusions of far-reaching importance. E. G. R. T.

GENERAL

APPROACH TO THE HILLS. By C. F. MEADE. *London: John Murray*, 1940. 9 × 5½ *inches;* vi + 266 *pages; illustrations and sketch-maps.* 10*s* 6*d*

Few people are so well qualified as Mr. Meade to write about mountains and the development of modern mountaineering. In the course of a long career he has not merely climbed extensively in the Alps with distinguished guides, he has also visited the Himalaya, where his work of exploration prepared the way for the later successful ascent of Kamet. In this book he devotes several articles to certain of the more sensational incidents in modern mountain history, thus illustrating from fact that type of approach to the hills which, among some continental mountaineers, has set achievement and conquest as a greater ideal than the contemplative attitude which, by contrast, marks his own approach. Thus in the first section of the book the greater part is devoted to relating and analysing the exploits of others; this is accomplished with a sure judgment seasoned as much by sympathy as by criticism, and he is to be congratulated for the clearness with which he marshals and dramatizes his facts. The adventures recorded make some grim reading, and it is a relief to turn to the author's own experiences with his favourite guides from Savoy. There is a singular grace in the description of the Christmas party in his guides' native village of Bonneval, an interlude of brightness and warmth in the unbroken severity of winter in the Savoyard highlands.

The second portion of the book deals exclusively with the Himalaya. After discussing the problem of Mount Everest and the tragedy of Nanga Parbat in 1934, the author takes us in a charming narrative from the foothills of Garhwal to the upper snows of Kamet. The story is excellently told and the skill with which topographical detail is handled makes it easy for the reader to follow the route. The simple adventures of travel, the short character sketches of his companions, the careful planning for the main attack on the peak, all form a continuous story which is never lacking in human interest. The whole book is written in an easy and varied style, and must appeal no less to the general reader than to those with more expert knowledge. It is a delightful description of all that mountains have meant for the author, not only for recreation and travel but also for the friendship which united him with their inhabitants. H. E. G. T.

THE MONTHLY RECORD

RAINFALL MAPS OF PALESTINE AND THE NEAR EAST

Two rainfall maps, compiled by Dr. D. Ashbel, of Jerusalem and issued by the Hebrew University Press, have recently been received. One of these is a large-scale map in colour (third corrected edition) showing the distribution of rainfall in millimetres over Palestine, Transjordan, southern Syria, and southern Lebanon averaged for the period 1859–1938. The controlling factor of relief is well displayed. Thus in the Lebanon mountains the values are as high as 1700 mm. (68 inches) and in the anti-Lebanon 1500; whereas in the depression between they are as low as 600. On Mount Carmel the rainfall rises to 900 mm. and to 800 on the plateau of Judea, but falls to 50 (2 inches) over the Dead Sea basin. An inset map gives the distribution of rainfall over the Negev and the land of Edom to the south of the Dead Sea, and another gives the number of rainy days which range from ninety a year in the Lebanon range to fifteen in Transjordan. It should be noted that the rainfall of the Holy Land is mainly derived from Mediterranean winter depressions.

The other map for the Near East is on a smaller scale, and gives in shading the mean annual rainfall for an unspecified number of years over a territory ranging from the Caucasus to Egypt and from Persia to European Turkey. The highest figure in an accompanying list of one hundred and eighty-four stations is 2677 mm. (106·8 inches) at Batum in a very wet area on the eastern shore of the Black Sea, and the lowest 25 (1 inch) at Suez. The extremely complex and irregular distribution of rainfall noted in the Palestine map is here seen to be part of a general characteristic of the whole of the Near East. The Persian highlands are fairly wet as also the Anatolian coast especially in the west, but the great interior plateau, with about 500 mm. (20 inches), is predominantly dry.

On the Taurus mountains in southern Anatolia as well as on the higher ground of the neighbouring island of Crete the rainfall is a little over 1000 mm. (40 inches), but in the Syrian desert and parts of 'Iraq it is from 100 to 150 (4 to 6 inches). The highest isohyetal line which appears on this map, 3000 mm. (120 inches), runs along the axis of the Caucasus range.

SUBAQUEOUS RIDGES AND TROUGHS OF LAKE MICHIGAN

In the *Journal of Geology* for July–August 1940 Mr. O. F. Evans contributes an article on subaqueous troughs and ridges entitled "Low and ball of the eastern shore of Lake Michigan." The terms "low and ball" are stated to be taken from certain English investigators on submarine banks along the British coasts who have designated "ball" as the ridge formed by waves below low-tide level and "full" as that formed between high and low tide (*e.g.* Dr. Vaughan Cornish, who however used "ball" for the associated line of breakers, *Geogr. J.* 11 (1898) 637).

The features described in the present paper are considered identical with those studied by the Germans along the shores of the Baltic Sea under the name of *Sandriffe*. They constitute a series of submerged troughs and ridges, built approximately parallel to beaches which have a gently sloping bottom and an abundant supply of sand, and they are attributed to the work of breakers of the "plunging" type as distinct from the gliding type. While the former stir up sediment from the bottom and move most of it to windward, where it may be deposited with formation of a ridge, the latter, having a less steep front, do not disturb the bottom. The structures remain in approximately the same position so long as conditions do not change. If change in the height or length of waves occurs the lows and balls move slightly onshore or offshore as the position of the breaker line varies: if the water-level is lowered or other factors cause the crest

of the ball to come nearer the surface, currents and waves of translation are set up across its top, causing the structure to move shorewards as a subaqueous dune. As the currents and waves so generated prevent the ball being built up above the water surface by the work of the breakers it cannot be regarded as the immediate forerunner of the offshore bar or barrier beach. Shorewards of the true lows and balls minor ridges may be built in various ways by waves and currents, which are sometimes mistaken for migrating balls.

Lake Michigan from the city of New Buffalo to Grand Traverse Bay was selected for study because along this coast the low and ball structures are found nearly everywhere and are exceptionally well developed. Sand is very abundant along the beach, and there are considerable areas where dunes have formed. On a bright day the balls can often be seen as light-coloured streaks parallel with the shore, as is shown by photographs from the air.

DECEPTION ISLAND AND PORT WILLIAMS

In our article on the Log of the *Hero* in the December *Journal* we remarked on p. 425 that line 15 of the log: "stood over for Deception . . .," seemed to be the first use of the name. Smith called it Edwards Island on his map. Hobbs gave the name of the harbour as Port William or Yankey Harbor (p. 41). Martin says, "Port Williams often miscalled Yankee Harbor." And we suggested the question whether William Smith in the brig *Williams* might have been there before Palmer.

We have since found in Aagaard, vol. 3, p. 416, the following passage: "When Captain Walker of the whaler *John* of London came back to England in 1821, he told that during the season there had been no less than thirty American seal-catchers at the South Shetland islands, and that they had given the harbour which Smith had named after his ship *Williams*—Williams Harbour, the name Yankee Harbour." For this Aagaard gives no reference. We know that Smith returned to seal in these waters in the season 1820–21: Bellingshausen relates that Palmer told him of Smith's success. When Palmer rejoined the Stonington fleet at Presidents Harbour on 24 November 1820 he went with them to a new harbour, whose name and place we do not know from the log of the *Hero*, because between November 25 and January 9 is as yet unpublished. Fanning speaks of the fleet lying at Yankee Harbour, Deception Island, during the season ot 1820–21. D. W. Clark in the *Hersilia* dated his letter of 18 February 1821 from Port William, New South Shetland, so that the harbour in Deception was still known to the American fleet by the name of William or Williams at the end of the 1820–21 season; and if the name came to it from Smith or his brig, Smith must have been there before the fleet under Pendleton arrived about November 25. Yet Palmer called the island Deception on November 18, and Smith called it Edwards Island on his map at the end of 1821. Martin reproduces two rough anonymous sketches of McFarlane Strait or Yankee Sound, showing the harbour which Powell called Hospital Cove and Weddell called Fanning's Harbour, but which Martin (p. 541) would call "the true Yankee Harbor," though he does not give any passage from the log which names either the sound or the harbour.

To disentangle this confusion one would like to know what the log of the *Hero* calls the harbour in Deception Island, whether there is any mention in it of Smith and the brig *Williams*, what, if any, use was made in the season 1820–21 of the harbour in McFarlane Strait which Colonel Martin insists is the true Yankee Harbour, and what the log calls it. May one hope that a complete reproduction, or at least a careful transcript, of the whole log will not be longer delayed.

PROBLEMS OF GLACIER MOTION

The *American Journal of Science*, 1940, contains a well-illustrated article on "Glacier mechanics" by Rollin T. Chamberlin, who presents a useful summary of what is known of glacier motion, including an outline of the problems still awaiting solution.

After discussing the origin of crevasses, transverse, diagonal, and longitudinal, and of the banded structure of glaciers, due partly to planes of slippage and partly to alternating blue and white ice, the author explains the mechanism whereby the glacier maintains continuity in moving down its valley. The controversies which arose in the time of De Saussure and Tyndall as to how a glacier could be rigid and brittle enough to crack into innumerable crevasses, and yet, like a river, mould itself readily to the valley configuration, produced no satisfactory solution. This was largely because the participants in these controversies did not realize the complexity of the phenomena which they sought to attribute to single causes. Since that time continued research by geologists and physicists has made it clear that a variety of processes enter into the movement of glaciers, though more investigation, including measurement to show how glacier velocity varies with meteorological conditions, will be necessary to evaluate them properly. Among the processes mentioned as promoting the downhill passage of ice-streams are slip along planes of shear, small adjustments between the glacier's innumerable granules of *névé* and glacier ice, and also minute slip along certain planes within its ice crystals. The work of Mr. Seligman's Jungfraujoch party in 1938 is cited in connection with internal movements of this character.

Local concentration of movement may occur along prominent shear planes; on some the displacement is slight, but others are striking thrust faults, on whose surfaces the overriding ice has been pushed forward for considerable distances, slipping on a large scale. Some of the slices in fact exhibit folding and faulting as in ordinary rock strata. The other small processes are not mutually exclusive: there may be slip within some granules and slip between some. A glacier moving by the summation of small slips within its granules, like the glacier moving by the summation of small adjustments between them, would change in shape to fit its valley and yet be a coherent crystalline mass.

It is emphasized however that, in spite of all the investigation which has taken place, we do not yet know precisely how a glacier descends its valley. Although the various processes and factors are fairly well understood individually, the exact contribution which each makes to the whole phenomenon of glacier motion has not been satisfactorily determined: the movement is accomplished by several processes acting together, and the relative importance of each probably varies with temperature, pressure, stress, and other conditions.

LONG-RANGE WEATHER FORECASTING

The Supplement No. 39 (1940) to the *Monthly Weather Review* comprises "Reports on critical studies of methods of long-range weather forecasting." The papers discussed in this volume review the various attempts, for the most part unsuccessful, to predict the weather either in sequence for several days ahead or in relation to deviations from normal in coming months and seasons. The research embodied in the reports was organized and supervised after the calamitous droughts of 1934 and 1936 by the U.S. Department of Agriculture on account of the importance of a knowledge of weather conditions for social and economic welfare.

Among fourteen contributions that of R. B. Montgomery on the work of Sir Gilbert Walker is perhaps of outstanding significance and appears first on the

list. Sir Gilbert, formerly director of the Indian Meteorological Service, worked out a large number of numerical correlation coefficients between certain weather elements in different parts of the world. These led to the discovery of three principal oscillations: one in the North Atlantic, where pressure below normal in the region of the Icelandic low pressure centre tends to be accompanied by pressure above normal in the region of the Azores high-pressure system; another oscillation somewhat similar in the North Pacific; and a third southern oscillation, marked by a tendency for high pressure in the South Pacific to be accompanied by low pressure in the Indian Ocean and vice versa. This last relationship is much the most significant and far-reaching, for it has a high persistence value useful for forecasting and when further developed is likely to give valuable indications for other regions including North America and Europe. On the other hand Walker's predictions of seasonal rainfall in India from Himalayan snowfall are shown to be less reliable.

A paper by I. I. Schell on polar ice as a meteorological factor is also noteworthy. When there is a heavy ice season in the Greenland Sea between April and July pressure is generally high over the polar seas in the following autumn and low over the British Isles and France with increase of rainfall. This and other associations can be useful in forecasting, but the writer emphasized how difficult it is to evaluate correctly the influence of the ice factor on the weather. Ice however probably combines the right degrees of inertia and sensitiveness to act as a useful index of the general circulation and the weather.

Mention should also be made of reports by Schell and others on the work of Baur in long-range forecasting in Germany. This is a statistical method differing from other statistical methods in giving more attention to the underlying physical causes of weather changes. Too much reliance however seems to be placed on the supposition that like meteorological conditions should be followed by like, which no doubt helps to explain why only a limited success has attended Baur's method. So far as can be judged the physical state of the whole atmosphere at any instant is never exactly repeated and certainly no two weather charts are ever alike in all particulars; but even were such a repetition to occur the sequence might diverge and not run parallel unless all the external factors affecting the atmosphere, as well as the internal conditions, were identical.

In the last two papers an examination is made by L. F. Page and H. C. Willett of the claims of H. H. Clayton to predict the course of future weather by variations in solar energy. Clayton's investigations have always been conspicuous for disregard of the immense complexity of the whole subject, and hence it is not surprising that his results are shown to have little practical value.

MAPS FOR LONG FLIGHTS

In an article recently published in *Aeronautics* Mr. Francis Chichester maintains that the only projection for a long-distance flying map is Mercator's, and for laying out great circle courses the gnomonic. His arguments in favour of Mercator are naturally those which have made the Mercator chart universal in marine navigation: every straight line is a rhumb line; a minute of arc is a nautical mile; one can scale off longitudes from the margin, and plot a given latitude and longitude with ease. A minor disadvantage is that the scale varies with latitude; major, that marine charts show no detail inland, that there are no adequate land maps on Mercator's projection, and that to draw these is troublesome because of the constant change of scale.

An International Convention in 1919 resolved to adopt Mercator's projection for a proposed International Flying Map of the World. The last index, published by the Ordnance Survey in 1930, showed that sixteen sheets had been

published, in a block which had one missing in the middle. Mr. Chichester makes no reference to this series, of which Great Britain produced eight sheets, France seven, and Poland one: after which the publication was discontinued. In the last few years some twenty sheets of the International Map have been redrawn with special air information: one cannot call the single British sheet dated 1934 a happy example of the new convention. In effect then, there is as yet no serious attempt to make a map specially for world flying, and it is interesting to consider what might be done with present experience. The convenience of the loxodrome property of Mercator, argued from sea navigation at low speeds, is in practice much diminished by the rapid change in compass deviation, which imposes frequent change of compass course on a long flight, even if loxodromic.

A very long flight must be studied first as a great circle route; but (as at sea) must be modified to use natural landmarks and organized landing grounds. Only the very exceptional flight can be laid out for pure celestial navigation, almost irrespective of the intermediate ground, and for general purposes one may suppose that the great circle question is disposed of in comfort before the flight begins. In that case it may be solved more readily with a map on Mercator's projection, normal or oblique, and a transverse Mercator graticule, rather than with the gnomonic projection advocated by Mr. Chichester. The Secretary R.G.S. will be interested to receive any information upon current practice from those who have experience in laying out long courses for world flights.

In a preliminary note, "Maps of the world on an oblique Mercator projection," published with a sketch of one such map in the *Geographical Journal* for May 1940, there was some slight account of the method. Since then a whole series of oblique Mercator maps, with different poles, has been drawn, and it is hoped that further examples, with great circle courses plotted from the trans verse graticule, will be published in the *Journal* within the next few months.

OBITUARY

LIEUT.-COLONEL SIR ARNOLD TALBOT WILSON, K.C.I.E., C.S.I., C.M.G., D.S.O., M.P.

A son of the late Canon J. M. Wilson, Arnold Wilson was born on 18 July 1884, educated at Clifton, received the King's Medal and Sword of Honour at Sandhurst, and from the 32nd Sikh Pioneers was transferred to the Indian Political Department in 1909, having already served in Persia from 1907. After special duty in Luristan he was British Commissioner on the Turco–Persian Boundary Commission in 1914, was a political officer with the Indian Expeditionary Force in Mesopotamia, and became Deputy Civil Commissioner in 1916, on the staff of Sir Percy Cox, ending his official service as Acting Civil Commissioner and Political Resident in the Persian Gulf from 1918 to 1920. He then retired from the public service and took up a high appointment with the Anglo-Persian Oil Company, which he held until 1932. In 1933 he was elected to Parliament as member for the Hitchin Division of Herts; was Editor of the *Nineteenth Century and After* for four years; was chairman of several official Boards and Committees, and wrote important books: 'The Persian Gulf' (1928), 'A bibliography of Persia' (1932), two upon the development of the administration and constitution of Iraq (1930 and 1931), and 'The Suez Canal' (1933). To our *Journal* he contributed "A journey from Bandar Abbas to Shiraz" (1908), "The delta of Shatt al 'Arab" (1925), and "A Periplus of the Persian Gulf" (1927). He served a year on our Council, 1928–29.

Sir Arnold had immense industry and power of work, a crusading spirit, and great independence in thought and action. Having held as long as possible the belief that some basis for an agreed settlement might be found, in October 1939 he obtained a commission as Pilot Officer in the R.A.F. at the age of fifty-five, trained as an air gunner, and was reported missing in June last. His death in action was presumed at the end of November.

MEETINGS: SESSION 1940–41

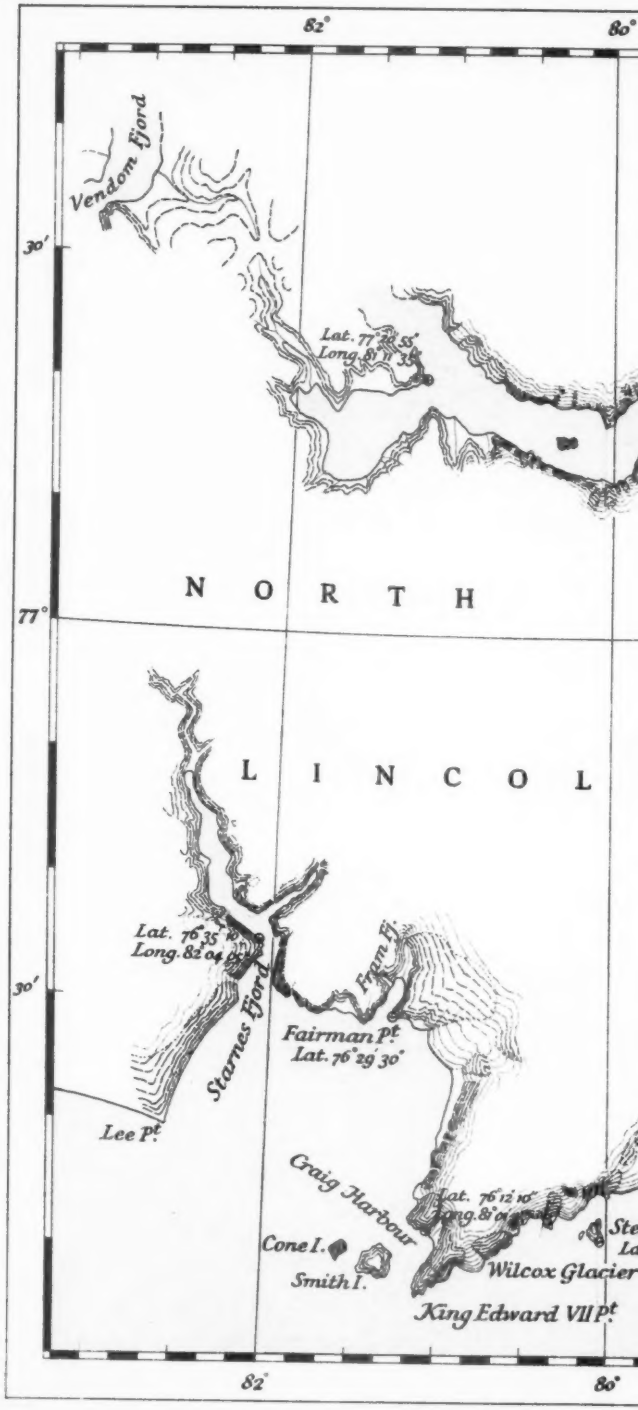
Sixth Meeting, 9 December 1940: Mr. W. L. Sclater, Honorary Secretary, in the Chair

Paper: The Severn Waterway in the Eighteenth and Nineteenth Centuries. By Mr. W. G. East

Seventh Meeting, 16 December 1940. The President in the Chair

Elections: Miss Jean Gallatly; Captain Robert Hamond; James McLernon; Norman Mitchell; Wilfred Savage, M.A.(OXON.)

Paper: Sierras of Venezuela. By Mr. A. E. Gunther



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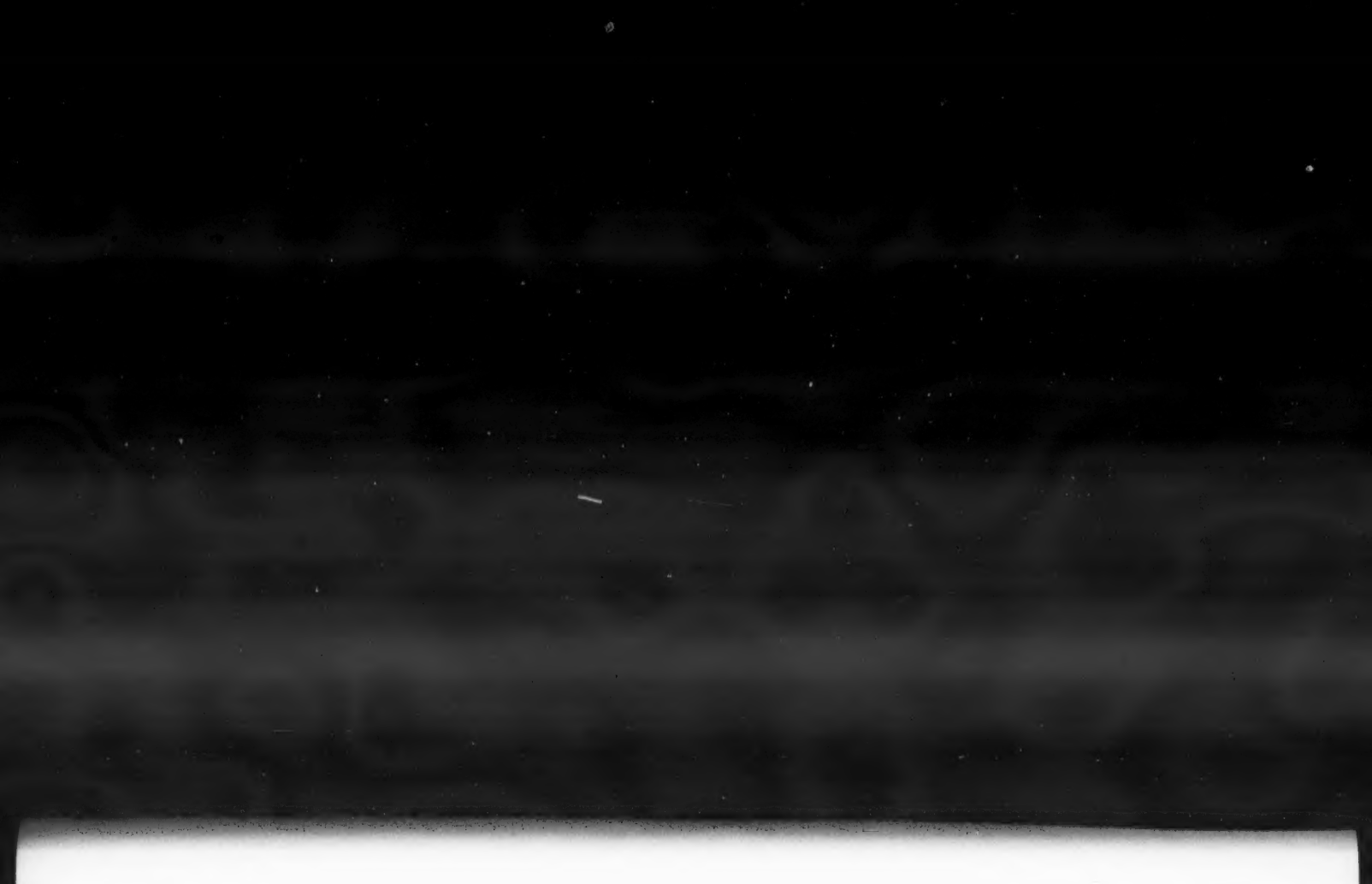
Norwegian Bay
Baumann Fj.
Bjorne Pen.
Vendom Fj.
Miles
20 0 20 40
Sledge journeys 1937 1938
Blue Fj.
Eids Fj.
Sor Fj.
Stenkul Fj.
Makinson Inlet
Smith B.
Clarence Head
Northstrand
Olsebaasen
Goose Fj.
Muskox Fj.
Boad Fj.
Sydkap Fj.
Harbour Fj.
Griese Fj.
Starnes Fj.
Fram Fj.
Craig Mt.
Stewart Is.
South C.
Jones Sound
Cone Is.
Smith I.
C. Sparbo
C. Spencer
Coburg I.
Bjorne Head
DEVON ISLAND
Makinson Inlet
Smith Bay
Clarence Head
Lat. 76° 49' 50"
Long. 77° 42' 20"
Cape Norton Shaw
Lat. 76° 26' 15"
Stewart Is.
Lat. 76° 12' 05"
South-East Coast of
ELLESMERE ISLAND
from a survey by
Robert Bentham, 1937-8
Scale 1/1000000
Miles
5 0 5 10 15 20 25
80°
78°
77°
30'